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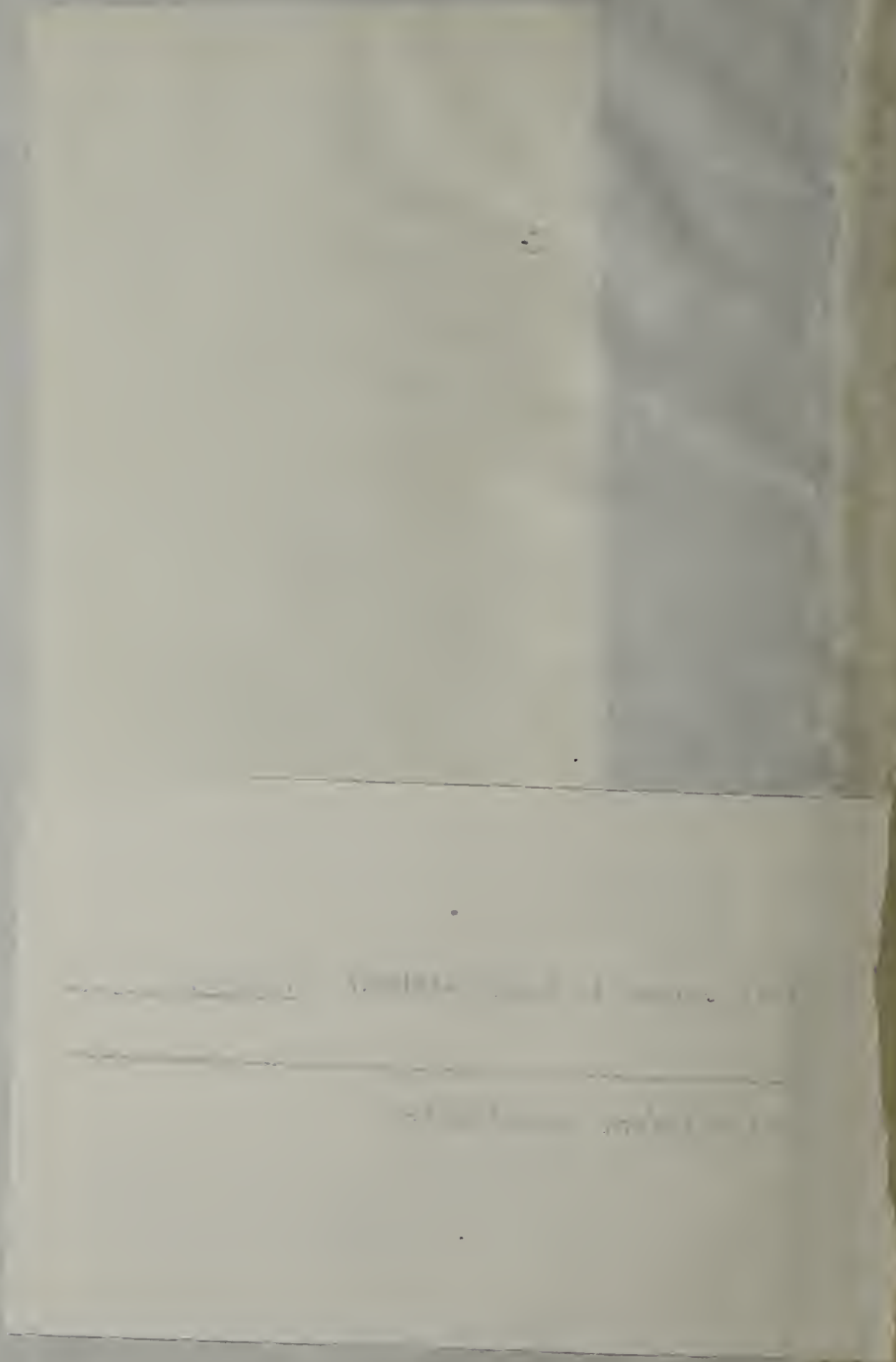
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THE DRAINAGE JOURNAL

JANUARY, 1891.

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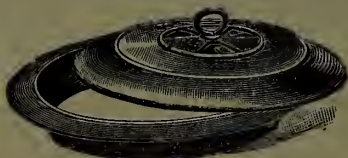
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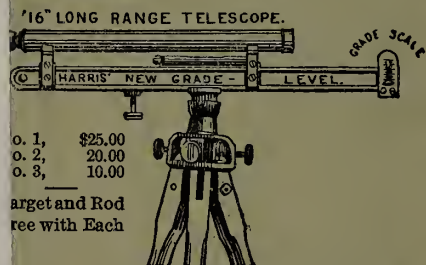
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THE DRAINAGE JOURNAL

Vol. XIII. JANUARY. No. 1.

WHY DO WE TILE DRAIN LAND?

BY DR. W. L. CHAMBERLAIN.

When I left my farm in Hudson, O., eleven years ago next May to enter upon public work for agriculture. I had already tile drained about 45 acres, two rods apart and thirty inches deep, using about eleven miles of tiles, nearly all of which had been laid by my own hand. The last field begun contains 36 acres, and I had finished over 20 acres of it when I was called away. The part not drained was quite rolling; more so than the rest of the field, with no part of it of any great extent so level that the surface water would not readily run off. The soil is pretty stiff clay.

Here was a chance (given by my sudden call to other work) to judge, from the crops side by side, whether tiling really pays on such rolling clayey soil. A comparison of results for eleven years has proved to my mind beyond all doubt that it does pay; in fact, that I cannot afford to leave this part of the field longer without tiling. So now the tiles are brought, about three miles or 16,000 feet of them; the ground is all laid out as I shall hereafter describe; a deep, straight furrow has been plowed where each drain is to be and the actual work of laying the tile is fairly begun (November 20.)

The general subject I may perhaps best discuss before entering upon the

particular problems suggested by this field.

First. Why do we tile drain land at all? The common reply is: "In order to relieve it of surplus moisture." But what is "surplus moisture?" It is the water of complete saturation which soaks the soil to mud, injures its texture and its present or future crops, or both. Sandy, gravelly and other porous soils have *natural* underdrainage and therefore do not need tiling.

Second. What soils do need tiling?" The last sentence of the preceding paragraph suggests the reply. Any soil on which surface puddles or water will stand in depressions for days or even for several hours without soaking it, needs tiling. Such soil if desired for tillage under a rotation in which wheat, clover and corn or potatoes are at all prominent, should be tiled with laterals near enough to draw off such surplus water promptly, in order to make proper and timely tillage possible during wet seasons. For permanent grass I doubt whether it will pay to tile clayey land.

Third. What are the effects of tile drainage on such soils? I give a few of them:

1. It makes the crop season longer and the number of possible tillage-days greater than even this lengthening of the season would indicate. The ground dries and warms much earlier in the spring and sooner after showers, and is

fit for working, fall plowing and potato digging, etc., much later in the fall. The fact that you can work the land so much sooner after showers in the case of corn and potatoes and other "hoed crops," often in a wet season is all important. It sometimes means just the difference between a good crop and one not worth harvesting.

2. Tiling makes the soil warmer. This is a fact proved by actual experiment and is explained by the law of physical science. If there is no under-drainage, natural or artificial, the surface soil must dry *from the top* by evaporation, in the spring and after each soaking rain. In the spring the water must thaw before it can evaporate, and thawing ice *by heat applied from above* is slow work as you know if you ever tried to thaw out a wooden pump by pouring in hot water. Evaporation of surplus water after the thawing is done in spring, or after a very soaking rain is not only a slow process which is bad enough when you are waiting to plant or till your crop, but is a very cooling process. Wash your hands even in warm water out doors in a cool, strong wind and you will see. As the wind dries or evaporates the water from your hands it chills them terribly. When they are dry they do not chill so rapidly. We sprinkle floors and pavements to cool the air by evaporation. A wet cloth on the patient's brow cools it by evaporation. But we do not want the soil thus kept cool in spring, and cooled after each heavy shower. Corn will not "sprout" well in a wet soil, for a wet soil is cold and then the growth is retarded by the cooling from evaporation of surplus water in a soaked soil. Tile drainage largely prevents this.

3. Tile drainage prevents surface wash and consequent loss of fertility. Especially is untiled rolling land sub-

ject to this waste. A soaking rain first takes up in solution much of the valuable elements of plant food found in the soil, and especially in manure which lies on or near the surface, and washes them away down some stream, sometimes with much of the soil, gullying the surface and wasting its fertility. If the land is tiled this rich water soaks down to the tiles through the soil, *which acts as a filter* and retains this plant food in the soil just where the roots can get it. The soil thus becomes a trap for fertility.

4. Tiling makes the "root-pasturage" deeper and more abundant. It does it in two ways; it makes the soil porous deeper and lowers the water level of super-saturation. The roots of agricultural (land) plants must have air as well as moisture. But when the soil is soaked all the air spaces are full of water. Tile drainage leaves the larger spaces in the soil free from water and full of air, while capillary attraction fills the smaller spaces with moisture. In a wet, soggy soil the roots must run near the surface to get air. In well tiled soil they can get air and moisture down deep, while the greater looseness of the soil permits the roots to permeate the soil deeper and more widely thus greatly increasing the area of their "pasturage." These two things they must have—air and moisture. They can get both best in a well tiled soil.

5. The tile drainage of clay soils makes wheat, clover and potatoes possible and successful year after year, as much as on the sandy and gravelly loams. Some years you can grow these crops on untiled land, but in a wet year potatoes fail or rot, and in a frosty winter, with little snow, wheat and clover heave out and kill by the frequent freezing and thawing. On my own farm, some years tile drainage has given a good crop of

wheat, when side by side that on the undrained land has been nearly or quite a failure.

6. Tile drainage saves us from the nuisance of frequent dead furrows or drainage furrows, needed for surface drainage on clayey soils not tiled. Ride a twine binder over the two sorts of fields and you will see the difference.—*National Stockman and Farmer.*

For the Drainage Journal.

IRRIGATION.

BY A. FURNAS.

In compliance with your polite request, to furnish an article on the subject of "Irrigation," for your valuable JOURNAL, I now proceed to do so.

I will suppose that the ground is reasonably level, that is, free from elevations that the water cannot readily reach, or basins where it would accumulate in undue quantities, and yet, with sufficient fall to induce the water to slowly flow over the ground. *Evenness* of distribution is important. For instance, if there is double the amount of water on one place that there is in another, the ground will dry unevenly, and the dry patches will be too dry, before the wet spots are dry enough to plow, for in irrigating orchards, or any crop that requires cultivation, the plow or cultivator must follow as soon as the ground is in good working order.

Ground with little fall is desirable, but suppose we have too much fall? Then we must run the water more or less at right angles with the direct course, in which it would naturally flow. This can be done by plowing a furrow or throwing up ridges so as to direct the water where desired.

As it is best to run the water the direction of the rows to be cultivated it is no uncommon thing to see corn, or potato rows running angling across the

field so the water can follow the furrow between the rows. If we are in the orchard we can choose our course among the trees.

All small fruits should be so set as to take on water to the best advantage for distribution, no matter whether the rows run with the lines of the land, or the highway. The all important thing to accomplish is the even distribution of water. Some tact and judgment is necessary in this matter, in laying out the water runs, and to the inexperienced it is sometimes safest to bring the "level," in requisition. This is the more necessary in consequence of the deceptive appearance of the lay of the land. It is an axiom here, that water will run up hill to get to the ocean. Why this delusion occurs I do not know, but it is so, not only with the "tender foot," but often with the old settler also. All these things are to be taken into consideration in laying out the irrigating ditches in the field, and, of course, the main line conveying the water on the field must enter it at the highest point. Land that is to be put to alfalfa is neither furrowed or ridged but embankments are thrown around the lot to retain the water on it.

Supposing the ground to be properly graded, so as to receive water, the next consideration is how to prepare the furrows or ridges to convey it where desired. This may be done with a common turning plow, or a single shovel plow, but most generally, a sort of three shovel plow is so made that it can be drawn by two horses, and thus three rows can be made instead of one. The ridger is a V shaped scraper, with the point open, thus: V. This is worked by pulling the wide end forward which makes a handsome ridge. This implement is mostly used in the orange orchard. It is a very simple contrivance, made of strong broad boards with cross pieces on top, and

would be just the thing for making ridges for sweet potatoes, "back east." For oranges this implement is run between the rows each way so as to leave the tree in the centre of a four square, thus each tree is allotted its portion of water.

With ridges and furrows all in readiness we are prepared for water. With a "gate" of water, which means an opening five inches high and twenty inches long, with four inches head, two men will be necessary to direct and distribute the water and work the "tappoon." This is a half moon shaped piece of sheet iron with wooden handle on the straight side, and is struck down across the stream of water, to stop it, or turn it, as desired. With a few "tappoons" and a long-handled shovel you are ready for business. Did I say ready? There is one other matter that the experienced operator will look to, that it is more, however, a matter of "taste," than anything else, it is your clothing. You may put on your store clothes, a "biled shirt," and black your boots, wear your plug hat, fine starched cuffs with moss agate sets, and perfume your handkerchief, but then you can make out with very common clothes, even old ones, except boots, which should be the best waterproof, at least I prefer good boots, but many of the young men go barefoot, with their pants rolled up to their knees and shirt rolled up to their elbow. Thus equipped he can wade, or, if necessary, thrust his arm in a gopher hole in stopping it up. By the way, these gophers cut considerable figure in irrigation. The water often finds its way into their holes and the contents of a run may pour in it for a long time, and then not fill it up. However, it generally does fill, sooner or later, and if Mr. Gopher is at home he must vacate. When he comes out he is as "mad as a loon." If he is

young, he will at once set to washing his face, much as a cat does when it is "slicking up," but if an old specimen, then he will rear up "on the hind legs of his dignity," and fight it out on that line to the bitter end. Such a thing as "run" is not in the gopher-make-up.

In irrigation you must cut your coat according to cloth. Under the Santiago water system the water is free, and a pro rata of it is conveyed with each acre of ground by deed with the land, and by schedule of time you know when your run comes and are ready for it. Our run comes every twelve days and a half and you can use the water wherever you wish—this time on the orchard, next time on the alfalfa, and next on corn and potatoes, or divide your run among your crops as you prefer. But you must use your run, for when your time is out your neighbors come in, and is quite as likely to want all his time as you are yours.

Just across the creek they are under the Santa Anna system, which is altogether different. There they can have water nearly at any time they wish, but they must pay twenty cents an hour for a day run, and ten cents an hour for a night run.

Thus I have only given you an inkling of irrigation, I think perhaps sufficient, for I suppose you only wanted a general idea of the work as a matter of curiosity. But, if not satisfied with this, come here and I will put you through a day and night run, and then you can do your own reporting. We have rolled logs together and I think we could irrigate also.

El Modena, Cal., Dec. 8, '90.

THE man who continually finds fault of everything because it is not to his liking, or because he was not consulted in their make-up, doesn't do much underdraining.

CORN SILAGE VS. DRY FODDER CORN FOR MILK & BUTTER PRODUCTION.

BY F. W. WOLL.

SUMMARY.

Feeding experiments with silage and dry fodder corn for milch cows have been conducted at this Station during the last six years. Two experiments were conducted to study this question further during the past year. In each experiment four cows were used; the plan of feeding was to give two of the cows as much corn silage as they would eat, in addition to a fundamental ration of hay, bran and corn meal, for a period of three weeks, while the other cows received dry, field cured fodder corn of the same kind, for the same length of time, with the same fundamental ration.

The milk was sampled and analyzed daily, and set separately; the butter churned out was also sampled and analyzed during the first experiment. As a result of both experiments it was found that the cows produced more milk and milk fat while on ensilage than while on fodder corn; but they also ate considerably more, and when the returns for the food materials eaten are compared, the fodder corn proved the most economical feed. In previous experiments, this same result has sometimes been obtained, and sometimes the opposite result. When the problem was further investigated, it was found that whenever the cows had been able to take more food materials while on one feed than on another, they gave poorer results as far as production per unit of food is concerned, on this feed. Given a certain sufficient amount of food materials in the rations, therefore, it seems that the less food the cows consume above that minimum, the more economically they are able to utilize it in the production of milk and its components. While the differences in a

single trial may amount to as much as 12 per cent. in favor of the nutritive effect of one feed, as in case of fodder corn this year, a consideration of a number of trials show practically no difference between the two feeds, and the general conclusion drawn, therefore, is, that corn ensilage and dry fodder corn, both properly prepared, possess equal feeding value for milk and butter production.—*Extracted from Wisconsin Experiment Station Report by Prof. W. A. Henry.*

SOIL WATER.

*BY F. H. KING.

TRANSLLOCATION OF CAPILLARY SOIL WATER

In my study of soil moisture I have found, on several occasions, that the distribution of water in the soil changes at times quite rapidly, so that one stratum has gained in water content at the expense of a contiguous one, and this redistribution of water may be conveniently designated "translocation."

The translocation of soil water is occasioned in at least two ways, namely:

1. By changing the porosity of a given stratum of soil.
2. By changing the amount of water a given stratum of soil contains.

Every farmer is perfectly familiar with the fact that properly firming the soil at the surface results in the drawing of water up from a lower level into the firmed stratum, and hence it is, as shown in discussing the effects of rolling, that the surface of rolled ground contains, on the average, a higher per cent. of water than contiguous unrolled soil does, and this concentration of water above is at the expense of water from below.

Rains frequently give rise to a translocation of water also. During my study of soil moisture it was observed on several occasions that when samples of soil were

*From experiments made at the Wisconsin Experimental Station.

taken just before a rain and then again after it, in the same locality, there was a marked decrease in the amount of water contained in some of the lower strata, and the same effects I have been able to produce at will, in illustration of which the following cases are cited:

On a strip of fallow ground of light clay soil, underlaid at a depth of 18 inches by a medium grained sand, water to the amount of two pounds to the square foot on an area of 8x8 feet was slowly added with a sprinkler, samples of soil having been previously taken in six-inch sections down to a depth of three feet. The samples were taken along a diagonal of the square under experiment and one foot apart, the middle sample of the line being from the center of the area. The sampling and wetting occurred between 1 and 3 p. m., July 22, and on the evening of the 23rd a corresponding series of samples was taken along a line parallel to the first but 8 inches distant. In Table No. 1 are given the results of these determinations:

Table No. 1.—Showing the translocation of water in soil due to wetting the surface.

DEPTH.	PER CT. OF WATER.		DIFFERENCE.	
	Before wetting.	After wetting.	In per cent.	In lbs. per cu. ft.
0- 6 in. ...	14.00	22.23	+ 8.23	+ 2.873
6-12 in.....	15.14	15.71	+ .57	+ .199
12-18 in.....	16.23	15.75	— .48	— .213
18-24 in.....	17.70	16.92	— .78	— .347
24-30 in.....	16.76	14.41	— 2.35	— 1.032
30-36 in.....	15.51	15.21	— .30	— .132

From this table it will be seen that the upper two sections of soil, that is the upper foot, were wetter at the time of taking the second samples than at the first, while the lower four sections were dryer than on the previous day and in harmony with several earlier observations. The figures given in the last col-

umn of the table are computed from the absolute dry weights of the upper three feet of soil as determined in a locality some rods from the place under experiment and are therefore only approximations, but the error due to this cause is certainly small.

It will be seen that while only two pounds of water to the sq. ft. were added to the surface, the upper six inches contained 2.87 lbs. per sq. ft. more than before the water was added, and the second six inches contained .199 lbs. more and this too in the face of the fact that the evaporation per sq. ft. of soil, from a tray setting on a pair of scales close by, was .428 lbs. during the interval under consideration. If the evaporation from the ground equalled that from the tray there is an amount of water to be accounted for equal to

$$2.873 + .199 + .428 = 3.5 \text{ lbs.}$$

The lower two feet of soil showed a loss of water equal to

$$.213 + .347 + 1.032 + .132 = 1.724$$

which added to the amount applied to the surface gives 3.724 lbs., a result as nearly equal to 3.5 lbs. required as could be expected under the circumstances.

On another occasion a nearly similar experiment was tried, also on fallow ground, and about sixty feet distant from the place just referred to. At 5:30 p. m. samples of soil were taken in one foot sections down to four feet at four equally distant places along the diagonal of a square 6x6 feet and the ground sprinkled. At the same time four other similar sets of samples were taken on lines vertical to the center of each of the four sides of the square but four feet distant from them. The amount of water the soil contained was then determined and at 11:30 a. m., 19 hours later, another series of samples was taken at points about four inches distant from the last, and the

amount of water in them determined with the results given below:

by sprinkling 1.33 lbs per square foot of surface, which added to 1.21 lbs., the

Table No. 2.—Translocation of water occasioned by wetting the surface.

DEPTH OF SAMPLES.	WET AREA.				AREA NOT WET.			
	Before Wetting.		After Wetting.		1st Samples.		2nd Samples.	
	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.
0-12 in.....	16.86	11.78	20.15	14.06	17.72	12.38	18.27	12.75
12-24 in.....	17.76	15.79	19.71	17.52	19.18	17.05	19.94	17.72
24-36 in.....	16.76	14.73	17.72	15.58	16.97	14.92	17.52	15.40
36-48 in.....	15.01	14.03	16.47	15.40	15.49	14.48	15.16	14.17
Averages.....	16.59	14.08	18.51	15.64	17.34	14.71	17.71	15.01
Total amount of water....		56.33		62.56		58.83		60.04
Amount of change.....				+6.23				+1.21

The interval of time between the taking of these two series of samples was one of small evaporation as most of it was night and the forenoon cloudy and on the point of raining which began shortly after the second set of samples was taken, a fall of .15 inches occurring during the afternoon and following evening.

amount the unwet area gained by the normal capillary flow over and above the amount of evaporation, gives 2.54 lbs. or the amount the sprinkled soil should have gained if the water had not modified the rate of capillary movement upward; but this soil did gain 6.23 lbs. If we deduct both the water added to the surface and that which may be called

Table No. 3.—Showing increased evaporation which may follow the wetting of the soil.

DEPTH OF SAMPLES.	WET AREA.				AREA NOT WET.			
	After Wetting.		Before Wetting		2nd Samples.		3rd Samples.	
	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.	Per cent. of water.	Lbs. of water per cu. ft.
0-12 in.....	20.15	14.06	19.11	13.34	18.27	12.75	18.27	12.75
12-24 in.....	19.71	17.52	19.17	17.04	19.94	17.72	19.94	17.50
24-36 in.....	17.72	15.58	17.42	15.31	17.52	15.40	17.81	15.72
36-48 in.....	16.47	15.40	16.48	15.41	15.16	14.17	15.57	14.56
Total amount water.....		62.56		61.10		60.04		60.53
Amount of change.....				-1.46				+1.49

It will be seen that the soil under both conditions had gained in water content, the wet area at the rate of 6.23 lbs. of water per column one square foot in cross section and four feet deep, and the area not wet at the rate of 1.21 lbs. Now the first area had received at the surface,

the normal capillary increment we shall have:

$$6.23 - (1.33 + 1.21) = 3.69 \text{ lbs.}$$

as the amount of translocation associated with, if not caused by, the wetting of the surface.

A third set of samples was taken 51

hours after the second set, and the change in the water content of the soil is shown in Table No. 3.

These figures show that during this second interval the rate of evaporation has been so related to the capillary flow of water upward in the soil that the unsprinkled soil has just about held its own while the sprinkled area has lost a full pound of water more than has been supplied by capillary action from below during the interval under consideration.

The cases of translocation of capillary soil moisture associated with wetting the surface, observed by the writer, are confined to a clay soil underlaid with sand, so that nothing can be said at present as to how general these phenomena may be. The fact is an important one, however, in its bearing on methods of tillage of this class of soils, some of which may be here stated.

1. *Cultivation after rains.*—Unless the ground is already too wet the stirring of the surface soil, wherever practicable, should follow just as soon after a considerable rainfall as the tools will work well. The cultivation should, as a rule, be shallow, leaving a thin stratum of the surface soil finely pulverized and completely cut off from the ground below. If this is not done the extremely rapid evaporation which takes place from undisturbed wet soil on hot, clear days may, even in a few hours, not only dissipate that which has just fallen but also a part of that which the rain has caused to be drawn toward the surface from lower levels, and thus leave the ground actually dryer, as a whole, than before the rain, even though it may look more moist at the surface.

When a succession of showers follow one another at just the right intervals and are of the right amounts to strengthen the capillary flow into the upper stratum from below each time, without

any percolation taking place, it is evident that such soils, left to themselves under these conditions, may lose not only the water which falls directly upon them but a considerable portion of that stored below, down at least to five feet. On the other hand, if each shower is promptly followed by cultivation there will be, at first, a movement of water upward, and finally the same rains, which under other conditions would leave the lower strata dryer than before they fell, may contribute a considerable amount by percolation to the deeper layers.

2. *Watering transplanted trees.* When dry weather follows the planting of trees it will be evident, from what has been said, that simply wetting the surface may, in certain localities, do more harm than good because, in these cases, the roots, lying as they do at considerable depths, cannot use water which remains at the surface, and as surface wetting may diminish the water content of the deeper soil, the soil about the roots is liable to be rendered dryer than before the wetting. So, too, repeated watering of this character would only exaggerate the difficulty until the soil of the root zone was too far dried to be further affected in the manner under consideration.

If, however, the surface soil, about the trees, is deeply spaded before watering the water will then enter the ground more deeply by the direct force of gravitation, largely unimpeded by capillary action, while at the same time the ability of the soil to return the water to the surface will be reduced to the minimum, and if a good mulch is now added the water will be under the best conditions for being used by the tree. So too, if the soil, about the roots of transplanted trees, is well firmed to insure the rapid transit of water to them, while the surface is

left loose and well mulched at the time of setting to prevent capillary action upward above the roots and to permit the rains to penetrate downward to them, we start the tree under the best possible conditions for growth so far as moisture is concerned.

3. *Relation to irrigation.*—The bearing of these facts upon problems of irrigation will be evident to those directly interested, and need not be dwelt upon here.

THE WELLHOUSE ORCHARD.

The people of Leavenworth County, Kansas, scarcely realize that within our county's border, the largest bearing apple orchard in the United States exists. Wellhouse & Son, of Fairmount, have in Fairmount Township, 437 acres of bearing fruit trees, and this year the eleventh crop has been harvested. The land is owned by L. B. Wheat, of Leavenworth, and Wellhouse & Son receive half the proceeds for their care and attention. This year's crop has been all gathered and we are indebted to Mr. F. Wellhouse for some interesting figures and facts.

This year's crop gave a yield of 79,170 bushels, more than double any of the previous yields, the next largest having been gathered in 1886, and made 34,909 bushels. The gross receipts of this year's crop were \$50,000. For several months 160 men have been employed gathering the fruit, and \$7,000 were paid in wages and getting the crop to market. Thus it will be seen that nearly \$100 were cleared off every acre.

On the 437 acres grew six varieties of apples: Ben Davis, 225 acres; Missouri Pippin, 70 acres; Winesap, 70 acres; Jonathan, 40 acres; Cooper's Early, 16 acres, and Maiden Blush 16 acres. It is, no doubt, of interest to our readers what Mr. Wellhouse considers the most profitable varieties. He says the Cooper's Early variety is not worth planting, the Winesap does not pay, and the Maiden Blush variety does not pay well. He considers the Missouri Pippin the best paying apple in his orchard, the Ben Davis next and the Jonathan third.—*Ex.*

Farm Drainage.



For the Drainage Journal.

HINTS ON DRAINAGE.

BY D. W. STOOKEY.

Before LAYING OUT a system of drains, study the plans and profit by the experience of others. If you would do your work well, have an experienced engineer lay out the plans with your advice and assistance. A few dollars expended in this way will save many by economizing the work, besides, giving better plans.

Begin at the outlet, walk over the land to be drained and set a small stake at each turn and branch. Decide upon the location and size of each drain before beginning the work.

KEEP A MAP of the drains, showing their location, depth, size, junctions, turns, length, etc. This will be found useful in finding the drains when wanted and in locating new lines that may be found necessary.

THE OUTLET, of course, should be at the lowest place, and, when possible, should open from a bank so that the tile may be well covered. The water should flow away readily and not be allowed to stand over the outlet, thus

retarding the discharge of the water in the tile.

It is often necessary to dig open ditches below the outlet to carry the water away. Sometimes it is necessary for owners of adjoining lands to unite and lay large mains to secure satisfactory outlets. At all events get and keep a good outlet.

In laying MAINS plan for future work and make them large enough to carry all the water that the branches may bring. They need not have a capacity equal to the sum of all the branches, as these seldom, if ever, all run full at one time, but only serve to gather the water from the different parts of the field. The size of the mains should increase towards the lower end as more branches come in. Sometimes in wide sloughs it is well to place two or more smaller mains a distance apart rather than one large one in the middle. The mains should be as straight as possible with the best results and least cost of construction, and should be free from short curves or turns.

THE BRANCHES should be as nearly parallel as possible and should enter near the top of the mains to prevent their receiving back water from the mains. All turns should be made with gradual curves and should be given a little additional fall to overcome the resistance of the curve junctions, should be made to discharge the water of branches as nearly in the direction of the current in the mains as possible.

THE FALL of drains of necessity varies with the lay of the land. In general, that the proper depth may be kept, the drain must be given such fall as the land has. As the land is often irregular this rule may be varied somewhat in order that the fall may be made uniform and distributed to the best advantage.

An irregular fall gives an irregular

velocity to the water and the tile will be only partly filled at those places with most fall while they are full where the fall is least. The bottom of the drain should have a regular grade with no ups and downs. Very little fall is necessary, and those rules requiring several inches to the rod or hundred feet, given by early writers, were absurd. The Illinois River has only a fall of twenty-seven feet in two hundred and twenty miles, or less than one and one-half inches per mile.

THE DEPTH of drains is controlled by the outlet and the uneven surface of the land. In general they should be from three and one-half to four and one-half feet deep.

Deep drains drain wider and thus reduce the necessity of lines being close together, besides giving deep soil and greater range for roots. Deep soils are less affected by floods, as they will hold more water beneath the surface, thus protecting the crops from standing water above the ground until the drains can take it away. They are less affected by drouth because the roots can go deeper. The cost of digging, the third spading need be but little more than the first or second as one man to each will carry the work along.

THE DISTANCE between drains varies with their depth and the nature of the soil. Deep drains will drain a wider strip than shallow ones, and, therefore, may be placed farther apart. Those in loose, open, mellow soils, will receive the water more quickly and from greater distances than those in stiff, close retentive clays.

At times during the winter the roads get good, smooth, and solid. Why not draw the drain tile necessary to do the intended underdraining in the spring? Much time and hard pulling of the team will be avoided and the work forwarded.

HOW TO LAY THE DRAIN.

BY S. J. WOOLLEY.

Before I had much experience in draining, I would dig my drain the whole length and commence at the upper end and lay the tile down stream, but I have learned from experience that the opposite of this is best. Always begin at the lower end and lay your tile as the ditch is dug. Stand on the tile in laying them and turn them until the joints fit, hitting them after with your boot-heel so as to keep them close together; lay broken pieces of tile over the joints where they do not fit and cover the tile as you lay them with a few inches of clay out of the bottom of the ditch to keep the loose soil from washing in at the joints, after which fill in with as much top soil as possible; it will facilitate the descent of the water.

On leaving the drain at any time, put a board or flat stone at the upper end so as to keep rubbish from washing in and on finishing the drain, at the upper end it must be well closed. The last tile at the lower end should be twice as long as the others, having holes through the end not over an inch apart, with wires so as to keep all animals out of the drain, and there should be a stone wall built across over the mouth of the drain, laid up with lime and sand or cement, so as to keep the muskrats from digging holes up along the tile. I have known them to dig holes on top of the tile to a distance of thirty feet which would form a water-course in time of a freshet, and wash the dirt from off the tile.

To know the size of the tile needed, learn all you can about drainage and use your own judgment. One eight-inch tile will carry off as much water as an open ditch four feet wide and two feet deep, and is sufficient for an outlet for fifty acres. Never continue tile of the same

size all the way. Whenever a lateral comes in, a smaller tile will do from that point on, and so on. It must be borne in mind that the tile is taking water all the time, at every joint. The tile at the end that has holes in it should be a size larger than the others, as the wires will impede the flow of the water to some extent.

DRAINS IN DROUTH.

It may be supposed that in such dry spells as we have had, tiles would be a dead issue, but those who have some in their land often notice encouraging results from them. The early part of this year was wet and cold and it seems strange to see cattle leave grass and clover in particular, on rolling hills and pick bare the low ground in the hollows where other years it would be left untouched, and would this year but for the tile; even bog that to-day would burn by the touch of a match, has a nice, healthy sod and removes the doubt of timothy not caching and making a sod on bog land when properly tiled. I have often thought when I read of the millions our Government spends on harbors and canals almost as experiments or often to catch votes, and as I read in the papers of the thousands asked for the irrigation of the arid plains and "balloon experiments" proposed by some of our United States Senators that if even a moderate sum was left by the Government to the farmers throughout the Northwest to use in tiling their land the benefit would be enormous to the farmer and also to the Government. This sum I would propose to be only a loan to be returned to the Government with a nominal interest at the expiration of a number of years. I have heard that some such practice has worked well in England for many years, and would not such an arrangement do well here?

There are millions of acres of lowland, excellent if tiled, owned by farmers in Wisconsin and Illinois that does not pay its taxes, that if tiled would by far excel its neighboring hills for productiveness. The owners haven't the present means of tiling and the State is the owner of so much more marsh instead of high priced land. Uncle Sam has been giving homesteads to his citizens for many years, encouraged railroad corporations by giving them sections, towns and miles of land while the farmer in the heart of the country requires to support all these undertakings by donations. Under a set of fixed rules the farmer who tiled his land receiving the first expense from the Government would increase the value of his land and the State so that the annuity would not be felt as an expense until paid, and in fact, would not be an expense to farmer or State, because where tile is put in properly where needed, it increases at once the value of the land and its ability to sustain drouths as well as continued rains.—*M. D. C., in Farmers Review.*

Correspondence.

Experience in Tile Draining.

Editor Drainage Journal:

In the August number, page 203, of the JOURNAL, I find an article entitled, "Mistakes in Drainage." I think the Professor is a little too technical and defines some things as errors which are not, in reality. It looks very nice on paper to have your ditches laid out by competent engineers and all on an exact grade, with tile just large enough to carry all the water and no more, and he caps the climax by saying ninety per cent. of ditches graded by the eye is "more or less a failure." I am afraid the author of that article is a book farmer and does not fully realize what

he is teaching. He says: "It will never pay to lay tile unless they are laid in such a way that their full capacity is utilized."

Let us see. Yesterday I was engaged in taking up a tile drain that was laid about twenty years since. It was mainly of 2-inch tile and the last two seasons water has stood on the land quite often, and it is always slow going off in the spring or at any time of high water.

This drain was laid before I owned the land and it empties 80 or 90 rods off on a neighbor's farm.

What am I going to do? Here I have a blue clay sink hole of one acre of my best land, no outlet except 80 rods on my neighbor or about 60 across my own, and that through a knoll that will require nearly five feet depth. The 2-inch tile across my neighbor is open but will not carry the water. If 3-inch tile had been used in the first place all this trouble would have been saved, and the extra cost would have been small.

Fortunately I have a drain within ten rods that I laid four years ago with 4-inch tile. This will carry more than is now required of it by using a silt. I will let the old 2-inch outlet take all it will and carry off the balance in the 4-inch main. In taking up some branches of this drain I found quite a distance laid with 1½-inch, these were badly choked up and of little use.

Years ago much of this kind of tile was used, but experience has taught our farmers better economy and now you can buy nothing at our kilns less than 2½-inch. The extra cost is trifling—about 25 cents per 100 for each additional inch. And when we consider the cost of digging, laying the tile and inability to closely estimate the amount of water or the length of drain that at some future time may be emptied at a given joint. Would it not be wise to lay good sized

tile, remembering that one 4-inch drain will carry as much water as four 2-inch, under like conditions.

C. M. GOODSPEED.

Skaneateles, N. Y.

THE TOUCHES OF THE NEIGHBORS.

BY THE AUTHOR OF "JOE BYERS' STORY."

CHAPTER XI.

In the midst of an active life, with our thoughts occupied, and thousands of little cares and touches required at our hand everyday, we are forgetful of the frailty of human nature. The flower may open in all its fulness to-day and give promise of lasting beauty but the hot wind may blast and scatter the withering leaves ere the sun goes down in the red glow of the western horizon.

At the last meeting of the Flower Band every member was full of hopes and plans for future work, each with her golden thread of life to weave into some useful fabric, so that they little thought that the next meeting day would be a sad gathering around the lifeless form (though beautiful in death) of one of their number, Miss Gertie Dawson. She was a most lovable girl. Mrs. Furman had visited her in her brief sickness and sat by her bedside as she triumphantly crossed the dark river. At the request of Gertie's parents, Mrs. Furman took charge of the funeral arrangements. She sent a messenger requesting all the members of the Band to be present. Six of the members served as pall bearers. They were dressed in white and the remaining members marched in close order next to the parents and near relatives of the deceased.

No funeral in that neighborhood that could be remembered had appealed so tenderly to the sympathy of all present. The promising age of the young lady so unexpectedly called to exchange the

mortal for the immortal, the devotion of the membership of the Flower Band, the part taken by them in the funeral services, was so timely and impressive that the entire attendance, though large, entered into the fullest sympathy with the sorrowing friends. Those in attendance at the close went away profoundly impressed with the solemnity of the occasion.

Mrs. Furman requested the members of the Band to meet at her home one week from that day. Promptly at the appointed time the young ladies were one by one most affectionately welcomed to the enjoyment of Mrs. Furman's home. Each of them had thoughtfully remembered to bring a bouquet of flowers, which Mrs. Furman arranged so as to give each a like prominence that was gratifying to all.

Three new members were enrolled.

"First of all, my young friends, I want you to spend some time in examining the flowers and other things in our yard and garden. I want to tell you about them, and have you tell me about yours," said Mrs. Furman.

The proposition was very heartily accepted. Mrs. Furman taking the lead, they passed from one to another of the flowering plants, discussing the merits of each, how to propagate and cultivate them. From the grounds about the house they passed into the garden. A more beautiful plot of ground, tastefully laid out, is seldom to be seen. It is the fall season of the year and gardens are usually not attractive, except for the turnip or cabbages that they furnish for the table, but it is not so with Mrs. Furman's. Here, there are flower borders, beds of strawberry vines and the rows of raspberries, blackberries and currants, bearing no haggard appearance so common to many farm gardens. Everything has been laid out in straight lines and

perfect squares. There are no weeds overtopping all, bearing noxious seed for the next year.

The young ladies were delighted, they spoke in praise of everything. Mrs. Furman was careful to give a detailed explanation of this object lesson. An hour or more was spent in exchange of experience and of thought. True, the young ladies had seen such flowers and vines before, but not in connection with the new thoughts about them. Before, they were not so attractive—now, they were clothed with interest.

Returning to the house, Mrs. Furman said, that at the next meeting she had it in mind to make a talk about how to grow strawberries. "I want," said she, "to induce every member of the Band to grow some strawberries next year, if it is only a rod or half a rod square of land, as well as flowers."

Many of the members said they would be delighted in the undertaking.

The selection of music for the next Farmers' Club meeting was made and sung, so as to make them familiar with the pieces.

"It is strange to me," said Miss Dorsheimer, "that there are so few pieces of music or suitable words set to music adapted for use at farmers' meetings. Why is it, Mrs. Furman?"

"I cannot tell, Gracie. Further on we may be able to make selections that will be more appropriate," said Mrs. Furman.

"Well, I hope so," Miss Dorsheimer replied.

The death of Miss Gertie Dawson was entered upon the records, and several of the members spoke briefly of her lovable character, and their affection for her.

Mrs. Furman had already written a resolution of condolence to be presented to Gertie's parents, expressive of their affection for their deceased friend and

member, and of sympathy for the family in their great sorrow.

The resolutions to be copied and presented to the family by the Secretary.

"Bury thy sorrow, the world hath its share,
Bury it deeply, hide it with care,
Think of it calmly when curtained by night,
Tell it to Jesus and all will be right.
Gather the sunlight aglow on thy way,
Gather the moonbeams, each soft silver ray."

It was a charming October afternoon and the golden sunlight was on the elms, when the Flower Band adjourned after having arranged for a little work in the way of compositions to be read at their next meeting.

The day for the meeting of the Farmers' Club was ushered in with a red sunrise, giving promise of a delightful day. The warm south wind lifted the leaves gently, or twirled them over and over as they fell from the trees one by one. By the noon hour there was a large company gathered at the village and an hour later the upper room of the school building was full. The Flower Band, during the forenoon, had hung the walls with rich festoons of fall flowers. Some of the young men assisted in the work, adding great ears and stalks of corn and sheaves of grain until it was, indeed, a harvest home meeting. The display was charming, especially to those in attendance for the first time.

The meeting was called to order promptly on the hour by the President, Mr. Moon.

After hearing the reports of the crops, probable yield, harvesting and prices, the committee on live stock made a written report as to the condition and care necessary to success. They advised the housing and other protection against the inclemency of the weather. The cold rains of the fall season were referred to as very damaging, that exposure to the cold blasts of winter necessitated the consumption of more food to maintain

the vitality of the animal. More shelter and comfortable quarters was urged as not only the better economy but humanitarian as well.

The report was warmly discussed, and agreed to unanimously, which was followed by Mrs. Julia Braxton reading a paper, subject, "The Farm Dairy, or Making Butter on the Farm."

"It is supposed, in all probability," said the writer, "that my paper will treat of the part that the farmer's wife is expected to have in making butter on the farm. First, we wish to express the hope that the time is near at hand when there will be co-operative dairies, with all the necessary machinery and conveniences for making No. 1 butter, and so far relieve the farmer's wife. Until that time, however, it is well to strive to attain to the highest standard in this art. But, let me make the plea that if the butter is to be made on the farm, the men should do the milking, which may be objectionable to some who are present. First of all, keep the best of cows, have comfortable quarters for them, treat them kindly, and feed them an abundance of the best food, feed regularly, handle gently, and milk promptly, and let the work of milking be done each time by the same milker. The stables and grounds where the milking is done should be free from any unsavory smell. During the grazing months the cows should have the best of grass. There is much difference, both in the quantity and quality of the milk, dependent upon the feed water, etc. We have one pasture field, which Mr. Braxton underdrained thoroughly years ago, that we have in bluegrass pasture and we have observed repeatedly that our cows do best on this pasture—the grass is sweeter and freer from wild, or water grasses, or noxious weeds. The next requirement is clean milking vessels, and the most cleanly handling of the milk. Butter is

very likely to absorb any unsavory smell—an old pipe smoked anywhere in the vicinity is likely to spoil the best butter. Set the milk in deep vessels, in water having a temperature anywhere from 40 to 60 degrees. Skim and set the cream away until it thickens well; do not let it get sour; churn in a rectangular or any other good churn, at a temperature of 62 degrees, or nearly so. When the butter grains are gathered into small lumps about the size of wheat grains, put in a handful of salt and turn the churn a few times, and then let the churn stand a few minutes—the butter will rise to the top. Then draw off the buttermilk, pour in clear water and wash the buttermilk out of the butter thoroughly. Dairy salt should be used in salting the butter, putting in half ounce of salt to each pound of butter. There is a difference, however, in the tastes of consumers. We supply one family that require the butter very strongly salted, another family requires only a medium amount of salt. We make it a rule to try and meet the tastes of our customers, or, make butter to suit the market. And this is the great secret of getting high prices for butter. The butter should be packed so as not to break the grain. The more grainy it appears the better it will be, and the longer it will keep. The custom of grinding the butter into a paste should be abandoned. I am quite well aware that there is a great deal of personal pride among butter makers. Almost everyone thinks that their butter is good enough for any market, but the proof of excellence is the price obtained, as a rule. In conclusion, I will add, that in selecting cows for the farm dairy, I would not recommend the keeping of cows that fall below ten pounds of butter per week when in full milk, and I would like to see them go up to twelve pounds, or more. Each cow should be tested

frequently to determine the value for butter. Unprofitable cows should be discarded promptly. The best of care, feed and management should be given to those that are kept, and the butter made to meet the demands of the market. If so, the farm butter dairy will pay, otherwise it will not."

Mr. President—The very excellent paper is before you to be discussed.

Mr. Elderpeth—I wish to inquire of Mrs. Braxton as to the price she gets for butter?

Mrs. Braxton—We get 25 cents per pound the year round. We could get more in the winter when butter is scarce but, supplying our customers through, as we do, the price is fairly remunerative.

Mr. Newman—I do not see why our merchants do not pay more for butter, they could if they wanted to do the fair thing.

Mrs. Furman — The quality of the butter has much to do in getting the high price. There are those, probably, in every community that make good butter—butter that ought to command a better price, but it is one thing to produce and quite a different thing to sell at the best price. A little effort to find good customers will often secure those who are glad to engage a regular delivery the year round. If those who make good butter let it go into the common tub at 10 cents per pound, rather than to seek a trade that will pay 25 cents per pound, the fault is theirs. But it may be urged, on the other hand, by some of the ladies, that they have not had the opportunity to arrange for the delivery of their butter to private families, if so, it is their misfortune. There is, however, a very great loss sustained by farmers at large who do not avail themselves of the better markets for their butter, that is, for their good butter.

Mr. Elderpeth—The rub is, in the kind of butter that is commonly made. Much of it will hardly make cooking grease.

Jesse W. Campbell read a paper, subject, "Sheep on the Farm."

"I am reminded," said the writer, "of the kind of sheep that were kept on the farm in my boyhood—mostly white, with a few black and some of Jacob's kind, ringed, streaked and spotted. They were coarse wooled, naked legs and bellies, and sometimes the fleece would half slip off before shearing time. They were neither heavy of body or fleece. Such sheep did not pay then and do not pay now. I occasionally, however, see little flocks of such sheep on farms through the country. They serve to browse the shrubs and weeds and gather in the beggar's-lice and burrs, but they do not pay. There are sheep, however, that pay their keep and a handsome profit besides. For the ordinary farm flock the coarse wooled sheep, such as the Leicester, Southdowns or Shropshires, select a few good ewes, and, with careful handling and good selection of sire and plenty of feed and shelter from the storm, will lead to a very desirable flock of sheep in two or three years, barring the dogs. Some of the most successful sheep growers, however, prefer the merinos. They bear more crowding, yield larger clips of wool, require less feed, are hardier, and, when fat, are highly prized for mutton. That which will keep twenty head of coarse wool sheep will keep thirty or thirty-five head of fine wool sheep. The raising of lambs is one of the main points in sheep growing. Breed from healthy sheep, discard all other from the breeding pen. See that each lamb is cared for, until it is able to make its way. Sometimes the care of lambs will necessitate considerable work and close attention to save some of the best lambs in bad weather. The weaning lambs should be turned into

fields having tender grass. Stubble fields having a growth of young clover makes excellent pasture. As the fall season advances, accustom the lambs to eat dry feed while running on the pasture. When the hard winter weather comes on they will thrive well on the dry feed, having been used to eating it. Fattening sheep, I have found in my experience, that from three to four years old is the best age, but vigorous sheep will fat well when five or six years old. In feeding to fatten, begin with a small quantity of feed and increase slowly each day until the amount of feed that they will consume with a relish, has been ascertained. But always reduce the amount of feed in warm, rainy weather. Let the sheep remain quiet at all times. Do not rush them up early in the morning. Let them rest until they rise up of their own accord. By so doing they will eat more, digest their feed better, and fatten faster. Again, let me advise those intending to keep only a few sheep to get the mutton or one of the large breeds of sheep, Shropshires are good. Then, with care and good judgment they will pay a handsome profit, if the worthless dogs can be put out of the way with poison. One important requirement in this connection is dry land—lands that are high and naturally well drained, or if the land is level, then it should be thoroughly underdrained. In my neighborhood our lands are level and we have observed closely as to the different effects of damp and dry soils as effecting the health of our sheep. Those familiar with the history of underdraining in England will remember that the fatality of sheep kept on wet lands in that country first suggested the propriety of underdraining the land, and the marvelous results in the betterment of the health of the sheep first awakened the mother country to the importance of underdraining. Give

your sheep dry land to stand upon and his hoof will be 'golden, indeed'."

Mr. Barton—This is my first visit to your meetings. I heard that you were having some interesting discussions and I determined to see what is going on, if I had to ride six miles to do it. The paper read by my friend Campbell (who is my neighbor) contains some valuable suggestions. His representations as to the weight of clip from the coarse wool or mutton breeds, as they are called, are not up to the standard. It is characteristic of the man to understate rather than overstate. I have twenty Shropshires that averaged eight pounds of wool to the sheep, and they are mostly ewes. I have also a bunch of lambs for which I have been offered \$5.00 per head.

Mr. Burk—For small flocks I favor the large breeds.

President Moon then announced that the audience would be favored with a song by the Flower Band, which proved to be a parody on "The Old Oaken Bucket." Several young men assisted the young ladies. The singing so far has proved to be one of the most attractive features of the meetings.

The President announced the following programme for the next meeting:

The usual reports on crops, stock, small fruits, vegetables, etc. Paper by Mrs. Furman, subject, "Our Country Social Life." Paper by Mr. Alexander Barton, subject, "The Farmers' Fruit Garden."

The adjournment of the Club was followed with a season of social talk. There were a number of strangers, some of whom had come eight or ten miles. The following brief talk will explain somewhat the growth of interest in farmers' meetings.

"I am so glad to see you, my friend Barton, how did you come to be with us to-day?" said Mr. Moon.

"I came to be with you. I have heard

of you, and, like the Queen of Sheba, I wanted to see if it was true."

"How have you found it?"

"Oh, like the Queen—the showing is better than I expected. How did you ever get your young people under such good training?"

"That is the work of Mrs. Furman, one of the excellent women," said Mr. Moon.

Their singing is delightful. I would give anything if our neighborhood had such an organization. How did you ever get it to going so well?"

"It is largely the work of Mr. Furman, our secretary, and his wife."

"I want to get a copy of your constitution and rules, for I am going to talk this up in my neighborhood. Won't you come over and help us to organize, if we undertake it?"

"Certainly. I will be glad to come," said Mr. Moon.

Mr. Barton's home was six or more miles distant, and yet the talk about the Farmers' Club had gone far beyond him, taking in a radius of many miles. He went home determined, with the help of Mr. Campbell, to organize a farmers' club.

Mr. and Mrs. Furman on their way home were discussing some of the features of the meeting, when Mr. Furman said:

"The selection of men from a distant, or other neighborhoods, to read papers, will have a good effect all round. It will increase the interest in our Club and make other neighborhoods interested in farmers' meetings. Both Messrs. Campbell and Barton were delighted with what they saw to-day—at least, they said so."

"Yes, Charles, I think they were. Each of them came to me to make some inquiries as to the part the young people have taken in our Club."

"I think it very probable, Edith, dear,

that they will not find the same favorable conditions in every neighborhood for organizing the young people."

"That is likely, Charles, but if one plan does not succeed, another may."

"Yes, yes, that is so."

[To be continued.]

Agricultural.

IMPROVING THE SOIL.

There are three methods by which the soil may be improved. These are drainage, cultivation and manuring. Drainage not only rids the soil of surplus moisture but also places it in condition to be worked earlier, puts it in a better tilth and adds to its fertility by straining the water as it passes along the ground.

Many fail to appreciate the advantages of thorough cultivation as a means of improving the soil. A good plowing in the fall leaves the land in a better condition to be benefited by thawing and freezing. It throws apart the hardest clods and renders available the plant food that they contain. Preparation and cultivation in the spring aids to make plant food available. The finer the condition of the soil the larger will be the supply of available plant food. This is one of the chief benefits of thoroughly preparing the soil for the reception of the seed and then of keeping it in a good condition by cultivation during growth.

The conditions of the soil that are most favorable for plant growth are also best for its improvement, and thorough cultivation enables us to maintain these conditions more perfectly.

Manuring adds to the supply of plant food in the soil, but in order to be of the most benefit to the growing plants it is necessary that the fertilizers should be in available condition. The action of some materials is to so act upon the soil

as to increase the amount of available plant food while others add to the amount in the soil. This fact must be considered in manuring. All three are dependent upon each other in securing the best results and a failure to supply anyone of them will effect the general result, while the more thoroughly each is given the greater will be the improvement.—*N. J. S. in Prairie Farmer.*

COOKED POTATOES FOR FATTENING HOGS.

BY W. A. HENRY.

SUMMARY OF RESULTS.

The following experiment was conducted for the purpose of determining the value of potatoes for fattening hogs. The trial lasted 42 days, with hogs about 10 months old. There were three hogs in each of the first four lots, and two in the last two lots. The potatoes were cooked with so little water that the mass after becoming thoroughly soft weighed no more than the raw potatoes did in the beginning. It was found that the hogs did not like the potatoes when much water was used in cooking. The meal fed was mixed with the potatoes immediately after cooking. The results were as follows:

Food required to produce 100 lbs. of gain.

Lot I	438 lbs. corn meal, only.
Lot II	{ 290 lbs. corn meal. 870 lbs. potatoes.
Lot III	{ 307 lbs. shorts. 920 lbs. potatoes.
Lot IV	{ 310 lbs. corn meal. 620 lbs. potatoes.
Lot V	441 lbs. of corn meal, only.
Lot VI	{ 234 lbs. corn meal. 707 lbs. potatoes.

Lots I and V were fed alike; also II and VI. Combining the results we have:

- (1.) 440 lbs. corn meal produced 100 lbs. of gain.
- (2.) 262 lbs. corn meal and 789 lbs. of potatoes produced 100 lbs. gain.

This shows that 789 lbs. potatoes took the place of 178 lbs. of corn meal, or 443 lbs. of potatoes were required to take the

place of 100 lbs. corn meal. This makes one pound corn meal worth nearly four and one-half pounds of potatoes. We expected more favorable results than these, but such are the facts obtained. As there were several lots of animals experimented on, it is hardly possible that our results are very far from the average.

—*Report Wisconsin Experiment Station.*

BEATEN GOLD.

When this truth from the *Farmers Home* is beaten into the knowledge box of every farmer, they will be fit to govern the world, not before: "Running a farm is just like running a grocery store or a newspaper or any other business. Its not every fool can do it successfully. It requires thought, education, watchfulness, care, and above all, attention to business principles."

Rather strange doctrine to come from a Professor of an Agricultural College, but it is sound, nevertheless: "Prof. Kedzie of the Michigan Agricultural College, before the State Dairy Convention said: 'The most economical general manure for the farm is stable manure. It is a complete manure, containing all the elements necessary for plant growth and in the most available form. Special and commercial fertilizers may be used to supplement barn-yard manure, but they only hold a secondary position.'"

Mr. Smith gives his method of keeping out that depression. Hurrah for him: "Having seen the statement of Jones in a recent issue of *The Stockman*, Mr. Smith, who is one of the practical and successful farmers in his section, gives one of his schemes for keeping up the fertility of his farm as follows: After trying commercial fertilizers and getting good crops for all my field, I found still some spots of ground that were not as productive as others. I found that these

spots were invariably on elevated ground, so I determined to concentrate my efforts on these barren places. The manure produced from my good wheat and hay crops was hauled and distributed on these high points and the result was beyond my most sanguine expectations. The soil where the manure was spread was soon the best producing soil on the farm. Not only this, but the adjacent hillsides were benefitted greatly, for when the rains came and the water washed some of the substance out of the manure, it was nicely distributed all the way down the hill and not a particle was wasted. From this I learned that the best place to put manure is on the high places. I learned also that if we take care of the poor spots on our farms the rich portions will take care of themselves."

"The average dairyman's son would not hunt birds with a bull dog, but his daddy hunts butter with a beef animal and wonders why the tariff does not do better for him. The average cow has been bred with no reference to her temperament and purpose."—*Gov. Hoard.*

NEEDS OF AGRICULTURE.

What we need is more knowledge and the understanding to apply it. I do not believe in mapping out a course for a man. All we can do is to give him opportunities. The law of the survival of the fittest applies to all classes. It is the man and not the farm that ensures success. Here in America we have developed a people of self-reliance and peaceful disposition. To-day we see patents on everything that we use. This shows a people educated to think, to invent. No people on the face of the earth can compare with the Americans in this respect. Now we find that every farmer is equal to from five to eight farmers of the

old type. We exported last year 470,000,000 bushels of wheat, carrying off great values in nitrogen. I care not how rich your land is, it will not stand such a continued drain. I thank the Lord that those hillsides in New England are going back to forests. I would be glad to see that same thing in New York State to some extent. There are large tracts that should never have been cleared. They never yielded any profit after the last brush heaps were burned. How many acres are there in your farm that yield no returns? Did you ever think that perhaps that land needed a rest? I very often think we go over too much land. We might farm fewer acres and farm them better. We see all over the country concentration. You see it in everything. A single blacksmith no longer makes plows, but they are made at big plants. Two-thirds of the crops on one-half the land would be more profitable than a full crop on all the land. I always feel sorry when I see anything sold for less than it fairly costs. It hurts everybody. Reducing the area and increasing the yield is what we need to do. We have been breaking the laws of the physical world.—*Prof. I. P. Roberts.*

HER GRAMMAR.

Mrs. Hubby (a Harvard bride)—"It would be useless for me to disguise the fact, Bridget, that your ignorance of grammar is very marked. Let me try and correct you. For instance, does it sound right for me to say, 'Bridget, you've been a-settin' in the drawin-room?'"

Bridget (frankly)—"No, ma'am, it don't sound right, but I were only a-settin there the matther of a half hour or so wid my cousin Terence who is just over, I s'pose that runt of a second girl tattled on me."

Road Drainage.



IMPORTANCE OF GOOD ROADS.

The importance and the value to any country, any section, and every citizen from the highest to the lowest, whether tax-payers or tramps, of well constructed and properly maintained roads, is not easily estimated, but clearly it is greater than that of many affairs which are continually receiving the time and attention of the people in their homes, counting rooms, public meetings and legislative halls.

It is a matter to be considered side by side with our splendid and always improving system of public education, the assessment of our tariff duties, or the appropriations regularly made for river and harbor improvements.

But the question of the most particular interest, to-day, to you and me, as manufacturers and merchants, in this whole question of good and bad roads is, *what is the effect on our business?* Now it may be possible that there are those who will think they see an advantage for the carriage builder in poor roads, where in traveling over hills that might easily be avoided, going ten miles to make five as

the crow flies, pulling through the mud and sand that should be gravel and jolting over rocks that might be macadam, the vehicles of the unfortunate owners would go to pieces in one half the time they ought to stand under favorable circumstances, and necessitate the purchase of new ones, to the advantage and profit of the manufacturer.

But a man who entertains such an idea would waste no time in killing his goose to secure the last golden egg.

It must be clear to any man with the most ordinary business instincts that good roads mean thrift, liberality, and wealth. They mean good farms and good value to real estate. They mean that the farmer enjoying their use will save wear and tear, not only on his wagons, but on his teams, will be a richer man on account of them, and have the more money to buy your carriages, running into higher value.—*Albert Pope.*

GOOD DRAINAGE NECESSARY---CULVERTS.

To maintain good roads good drainage is necessary, and when properly constructed the open side ditch is the most practical and efficient. The expense of artificial underdraining precludes a discussion of its merits here. The ditches should not be deeper than necessary, and should be of as uniform depth as possible, with good outlets provided in all low places where water would stand without them. Let the roadway be of medium width, rounded evenly and uniformly from the outside of the other, with the centre sufficiently elevated to readily carry surplus water into the ditches. For culverts, stone arches are of course superior to wood, but we will have to pass them, along with paving and underdraining, for a large part of our country. I have found boxes made of 2-inch plank, using oak for the top,

more satisfactory than sewer pipe. Be careful to make them sufficiently large, and put good plank wings at the ends to prevent the banks being washed away. It is not a good plan to cover the plank with earth, as they soon rot under it. On either side of these culverts mud holes are sometimes formed, and it is a common practice to fill these with earth with earth taken out near the end of the culvert where it is handy and soft—easy to plow. But mud is mighty poor material to fill a mud hole with.—*Ex.*

ROADMAKING.

RESISTANCE TO TRACTION ON LEVEL ROADS OF DIFFERENT CONSTRUCTIONS.

It is not in our own country alone that the construction and maintenance of better country roads is attracting general attention. According to an authority on the subject in a paper lately read before a club of British farmers the resistance to traction on level roads of different construction and varying conditions is very great and has been computed to be comparatively as follows: On a smooth paved surface, 2; a well kept, dry macadamized granite surface, 5; a similar surface covered with dust, 8; a similar surface wet and muddy, 10; a gravel or flint road in a wet state, 13; a similar surface very wet and muddy, 32. Among other points enumerated by the same writer as

IMPORTANT TO ROADS,

they should be made wide enough to permit of vehicles passing one another with ease, particularly at night. From nineteen to twenty-one feet is considered a suitable width for the roadbed. If too narrow the traffic will run very much in one place, while a width greater than necessary leads to loss, as the wear of a road is caused by the action of the weather as well as by the traffic. The general tendency is either to allow a road

to wear hollow or to make it far too round. Thorough drainage is insisted upon as most important, and there, as in this country, it is more neglected than any other point. The mud scraped off from roads should be removed beyond the reach of wheels, that it may not be worked back again. Where a thick coating of hard material is required, it is better to put it on in successive thin coats than in one thick one. Where new material is spread on for the replacement of wear, the travel should be led to pass over such places—not to avoid them.—*Orange Judd Farmer.*

LEFT WITHOUT EXCUSE.

Fifty years ago, there was some excuse for bad roads, for our country was poor. Now it is rich, there is no excuse.

A good road is always to be desired, and is a source of comfort and convenience to every traveler.

Good roads attract population, as well as good schools and churches. Good roads improve the value of property, so that it is said a farm lying five miles from market connected by a bad road, is of less value than an equally good farm lying ten miles away from market, connected by a good road.

A larger load can be drawn by one horse over a good road, than by two over a bad one.

Good roads encourage the greater exchange of products and commodities between one section and another.

Good roads are of great value to railroads as feeders.—*Pope.*

WILL COST LESS THAN \$1.00 A FOOT.

Mr. E. A. Stare, of Sibley, Ill., is introducing his patent iron road for country roads. It is patterned after the double track street car line. The grooved wrought iron rails in the model are 8 inches wide and one inch deep, resting

on 3x8 inch oak stringers lengthwise, the stringers resting on iron crossbars half-inch by two inches. Between the rails can be laid paving brick, cobble stone or gravel, and Mr. Stare figures that the cost of the material alone will be less than \$1.00 a foot for the double track. He would tile the road and grade it so that surface water will run into the ditches properly. The question of proper country roads at cheap figures is a matter that is agitating the country generally, and Mr. Stare comes to the front with what appears to be the cheapest and most durable improvement. With the Stare road there would be a great saving of horseflesh every year; grain could be hauled speedily the year round, and farmers could dash into town every day and go home the same as in summer. Mr. Stare has arranged to have five miles of his road made in Ford County.—*Deatur Republican*.

The price of platinum has recently advanced very greatly until now it is nearly equal in value to gold. In July, 1889, the price was \$8 an ounce; six months ago it was \$14, and at this writing it is \$20 an ounce, while gold is quoted at \$20.70. This rapid rise in the value of the metal is due to the steadily increasing demand from the manufacturers of electrical apparatus. Every incandescent electric lamp requires about one inch of platinum wire and nothing has yet been found to take the place of it.—*Age of Steel*.

In Indianapolis about \$12,000,000 is invested in wood working establishments and the annual product of the factories is valued at something near \$15,000,000. "With a few thousand dollars of capital," says the *Wood-Worker*, "any man of business ability who has had the experience, or is capable of adapting himself to such work, can make a fortune in wood manufacturing in Indianapolis in ten years."

Tilemaking.



REPLY TO "A TILE BURNER."

[We regret to say that this communication was received Oct. 24th, '90, and should have appeared in the *JOURNAL*, but was misplaced. This mistake occurred during the late political campaign and we do not hold ourself responsible for anything that occurred about that time.—Ed.]

Editor Drainage Journal:

In reply to "A Tile Burner" in your last *JOURNAL* we refer him to *DRAINAGE JOURNALS* of February and March, 1890, for our usual mode of burning tile, and to *JOURNAL* of August, 1890, for description of kiln. (We will give further description in *JOURNAL* as soon as possible.)

If we are hurried in our burning we watersmoke in 13 to 18 hours and finish in 15 to 18 hours more. We usually allow 48 to 60 hours for cooling, but sometimes less, although it is quite warm work. The clay we use is such as is obtained from almost all low lands in Ohio, generally termed "blue clay." Our kiln is 12x14 feet inside and slightly more than 7 feet high to the square. We nest our tile as closely as possible, viz., in a 10-inch we put a 7, 5 and 3-inch; in an 8-inch a 6, 4 and 2½-inch. The latter of the two kilns referred to was 8-inch as above, except the 2½-inch. We had none

dry. The tile in this kiln were uniformly burned with a very small—not to exceed five—per cent. of loss. The loss was, however, slightly more than in ordinary burns.

We wish to state further, that we now burn the same clay in less than half the time we formerly did in an updraft kiln, get a much more uniform color, with about one-fourth the loss. We formerly burned two or more nights, besides frequent watersmoking fires two or three other nights: now, unless hurried to more than one kiln per week, do no night burning later than ordinary bed-time.

If your correspondent desires to test his clay in our kiln and will ship us some of his tile prepaid, we will burn and return them prepaid, giving a record of their burning, etc., etc. Or, if he will come to our place while we burn a kiln, we will prove all that we have said, or pay all his expenses, and reasonable wages for his trouble.

Mt. Victory, O. STEWART BROS.

WOULD LIKE TO KNOW.

Editor Drainage Journal:

We would be glad to learn through the JOURNAL if two adjoining kilns—about sixteen feet apart—can be so connected that the heat from one while cooling off may watersmoke the other. How?

What is best for covering the crown of a kiln that is exposed to the weather? The heating and cooling and the rains soon take off anything we have tried.

NORTH VERNON TILE CO.

TILE LAID IN INDIANA.

The Statistical Report of Indiana for the year 1889, shows that there were 2,345,521 rods of tile laid in that year, or 7,320 $\frac{1}{2}$ miles. The Statistical Report of the State for the year 1888 shows that there were in operation that year 24,443,548 rods of tile drains. Add to this

amount the number of rods of tile laid in 1889 and we have an aggregate of 26,789,069 rods of tile drains, or 83,715 miles of tile drains in operation in the State. If forty rods of tile is required to thoroughly underdrain one acre, then the whole amount of drains already laid would only thoroughly underdrain 669,726 acres, or 1,046 square miles, or 29 congressional townships.

We are quite sure that the report is quite 25 per cent. short of the number of tile manufactured in 1889. Four hundred factories would have only an average output of 93,820 tile for the year. There are two or three factories that make quite 500,000 each. Besides, there are many factories that make 200,000 tile or more. So we very reasonably conclude that the report gathered by the assessors is much short of the actual amount of tile made or laid. It is quite probable that the amount in use will exceed the amount reported quite 25 per cent.

A USE FOR BRICK WASTE.

It is a fact peculiar to Spanish countries that ordinary brick dust, made from hard burned, finely pulverized bricks and mixed with common lime and sand is universally and successfully employed as a substitute for hydraulic cement. Mr. Miles, a well known engineer, says that during an experience of some six years in Cuba his opportunities were ample for testing its merits, and he found it in all respects superior to the best Rosendale hydraulic cement for culverts, drains, tanks and cisterns and even for roofs. In an experiment to test the strength of this product, it was found that a block of it one-half inch in thickness, without sand, and after an immersion in water for four months, bore without crushing or splitting, a pressure of 15,000 pounds per square inch. It is

thought that by the addition of pulverizing mills to brickyards, to utilize the waste and broken bricks, a profitable manufacture might be carried on.

GLEANINGS.

George Powell, Canal Winchester, Ohio, writes: "Business is very good with me, and it does me good to get the DRAINAGE JOURNAL. It is a great help to me and I intend to take it as long as I can raise the dollar. I can't do without it."

A. Van Hemert, Grand Meadow, Minn., writes: "Enclosed find my renewal for the DRAINAGE JOURNAL. I have been very much pleased with your JOURNAL and shall take it as long as it is published, if I live that long, and I can raise the dollar to subscribe for it. I consider it the most valuable educator that comes to my home. I have not done much draining as yet, but will do much of it if I live. The constant lessons will make me acquainted with the methods and when ready for the undertaking I will not need to make mistakes."

E. A. Stare, Sibley, Ill., writes: "I have had a good trade on tile this season, or, for the last four months. Will have all sold in another week at the present rates of sales."

S. E. Hagy, Etna, O., inquires: "Why don't you advertise the Joe Byers' Story? It has performed miracles. The little table on the back has opened the eyes of many blind men, and there are some blind ones left yet." [We know there are a few "blind ones" left—that is true. Some of them work with clay, but they don't get it on their eyes, as did the blind man that went to the pool and washed and came seeing. Possibly they lack the washing only. A few hundred copies of Joe Byers' Story ought to increase the demand for drain tile in any neighborhood. But that would cost a little money and very many people are so

short-sighted as not to see that they would or could ever get the dollar back, though they might get a hundred back for every dollar they expended in circulating the Story. "When the blind lead the blind they both fall into the (open) ditch." It is this class of people who want to be legislated into prosperity, who think that some way the government owes them a living, and ought to pay them or loan it to, them at 2 per cent.—Ed.]

J. A. Spahr, Springfield, Ill., says: "I find quite a difference of opinion as to the best methods of draining. I have been engaged in the business since '82. Here most of the drains are leveled and cuts given every fifty feet, and maintain a uniform grade if possible. We speak of grade here as being so much per 100 feet. We generally have two inches or more grade per 100 feet; where it is less we say so much per mile. I have recently been to Rich Hill, Mo., to look over 2,400 acres with a view to contract the drainage of the tract. There is much work in large contracts to be done.

THE DIFFERENCE.

The following from the *Stockman* needs no endorsement: "But, General Rusk, what is the difference between a farmer and an agriculturist?" "A farmer," replied Uncle Jerry, "is a man who runs his farm for all there is in it; who does not waste on fool experiments and who, as a general thing, comes out at the end of the year with a good profit. An agriculturist is a theoretical farmer, a man who who puts more money into the land than he ever gets out of it, and one who is always trying some experiment to make a fortune and seldom makes a cent. Well, I have been both, and while I was a farmer I made money. I believe there is money in farming to-day if the proper business brains are used in running a farm and I doubt not that matters will finally regulate themselves and the farmers will again become prosperous." Nor this from the same journal: "When land once become impoverished," said Sir J. B. Lawes, "I know of no way in which its lost fertility can ever be restored from its own resources."

The Drainage Journal.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete: you will have use for many things published and the volume complete will make a valuable book

*J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.*

SUBSCRIPTION RATES.

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten ".....	8 00
Single Copies.....	10

Send for rates for larger clubs.

TO ADVERTISERS.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile.

It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers.

It is the best possible medium for those having tile machinery, brick machinery, kilns, fire brick, engines, ditchers, clays, tile yards or second-hand machines for sale, to advertise in.

The rates of advertising are reasonable.

ADVERTISING RATES.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1.

Twelve lines Nonpareil type make one inch.

Liberal discount for longer time and largerspace.

Transient advertisements must be paid for in advance.

For large advertisements address the publisher for terms.

1891---VOL. XIII.

With this number of the DRAINAGE JOURNAL we begin the thirteenth year of its publication. The field of usefulness seems wider than at any time before since the establishment of the JOURNAL.

We heartily thank our many readers for their continued patronage. We have many upon our subscription list who have taken the JOURNAL from the first year, and very many who have, from the beginning of their subscription, continued to this date embracing a number of years.

We have new subscribers who write us much like the following:

"I am one of those who wish they had subscribed for the JOURNAL sooner.

JAS. THOMPSON, Fortuna, Cal."

We are often compelled to disappoint our new subscribers in not being able to supply them with back numbers of the JOURNAL embracing two or three or four years. We print at the time of each issue the number that will probably in our judgment supply the demand, but it frequently occurs that an unexpected demand arises for a particular number, and every copy that we can supply is soon gone, while copies of other numbers are left over. Both the November and December issues have been short in number to supply the demand. We would gladly fill the orders if we had them. The January number will be largely increased, so that we hope to be able to meet the demand.

We wish our readers the compliments of the season, hoping that the year 1891 will be a prosperous one to all.

RENEWAL OF SUBSCRIPTIONS.

Renewals of subscription have been as satisfactory as at any time since we commenced the publication of the JOURNAL, if not more so, but, (if we did not have to use this little word "but" how happy many of us mortals would be, "but" we have to use it occasionally), "but" there are those who do delay renewing, not because they are short of funds, "but" because they dislike the trouble, and think "I will attend to it when I get a good ready," and delay the matter longer than they really intend.

"But" it will oblige us to have our subscribers renew their subscriptions promptly at the expiration of the time for which they have paid.

TWO OR MORE ROWS OF TILING LAID TOGETHER.

A correspondent makes inquiry as to the practicability of laying two or more rows of tiling together. It is not infrequently the case that tile large enough to carry the water in a single drain cannot be secured. In such cases the laying of two lines of tile become necessary, and it is a common practice to lay the lines of tile side by side. Less digging is required where they are laid together. This method is objectionable, for the reason that it is not possible to fill between the tile, so as to prevent a flow of water between the tile. Some clays are inclined to wash, so badly that the tile are likely to be undermined by the current of water running between. There are few clays that do not have sand pockets; where there are, the tile are likely to become displaced. There are many instances where underdrains have become obstructed or washed out so as to undermine the earth above the tile to an extent that the surface earth has fallen in at the point where the obstruction occurs. In such cases the tile are found lying in every conceivable angle; some on end. The displacement of the tile may not occur for one or more years, yet it is liable to occur where two lines of tile are laid together. Where the space to be drained will admit of it, it is better to lay the lines of tile separate—several rods apart if it is practicable. The lands along the line of the drains will be better underdrained and a much greater width can be underdrained, if the lines be laid apart. For permanent, and the more satisfactory results in a run of years will be to lay the lines of tile apart, if it is only a few feet apart, and where the surface will allow, lay them so as to drain the widest space possible. It will add to the cost but more to the efficiency.

MEETING OF CONVENTIONS.

The Indiana Tile and Drainage Association will meet during the sessions of the National brick Manufacturers' Association. It is suggested that the Association meet on January 22nd, 1891, at 10 A.M. in this city.

The National Brick Manufacturers' Association will hold its fifth annual meeting in Indianapolis, Ind., January 20, 21, 22 and 23, 1891.

The Illinois Brick and Tile Association will meet in Springfield, Ill., Tuesday and Wednesday, January 13th and 14th, 1881.

The Iowa Brick, Tile and Drainage Association will meet in Des Moines, Ia., Wednesday, February 4th, 1891 at 10 A.M.

The Ohio Brick, Tile and Drainage Association will meet in Columbus, Ohio, February 25th and 26th, 1891.

THE THIRTY-FOURTH ANNUAL CATALOGUE.

The Thirty-Fourth Annual Catalogue of Clayworking Machinery, issued by J. W. Penfield & Son, Willoughby, Ohio, is received. It is a beauty, unique and instructive. It embraces a full line of clayworking machinery manufactured by this firm, in short, everything in the way of machinery and supplies needed in the business of manufacturing brick and tile (illustrated). In addition they have added drawings for

BRICK PLANTS,

in which the minutest details of the plans of construction are plainly outlined. The position of each machine, line-shaft, pulley, etc., is as plainly illustrated as if seen in actual operation. These plans are adapted to the several sizes of machines manufactured by this firm. Every want, in agreement with the extent of the business contemplated, has been anticipated in the plans drawn,

and so fully illustrated. These are accompanied with all necessary instruction. Including machinery, plans of plants, supplies, etc., there are over 60 illustrations.

ORNAMENTAL BRICK.

There are over 100 colored illustrations of ornamental brick, beautiful in design, and illustrative of the growth of esthetic taste in this line in the past few years.

We have only one suggestion to add: If one of the first catalogues issued by J. W. Penfield, a fac simile, could be attached in some way so as to make a companion piece of their late publication, it would be an object lesson illustrative of the wonderful advance that has been made in the art of clayworking in the past quarter of a century, as well as the possibilities of growth of a business faithfully and persistently followed, however small the beginning. This catalogue is indeed a book, but we conclude that they are for free distribution to parties who are likely to become interested in the line of clayworking.

Catalogue of Brown & Frazier Mfg. Co., Portland, Ind. for 1891, illustrated, embracing the full line of clayworking machinery manufactured by this firm. A copy of this catalogue will be sent to all making application for it. Send and get one.

"HOW TO GROW STRAWBERRIES."

We have just finished reading this very interesting little book written by T. B. Terry and A. I. Root. Our personal acquaintance with T. B. Terry has served to increase our interest in this treatise. We have a great deal of faith in Terry; we drink in every word he writes, believing that he will not knowingly mislead his readers. There is a thread of practical truth running through every line of this little work. We feel the prompt-

ings while reading it to make effort in the future to better achievements in whatever we do. We are going to grow some strawberries and we are going to follow the suggestions of friend Terry and we believe that many others will do so. We heartily wish that every family that has one or more rods of land at their command would read this little book. Price 35 cents. Address A. I. Root, Medina, Ohio.

News & Trade Notes.

T. F. Randolph, Cincinnati, O., advertises Daisy Level, which he says, is the best at the price.

J. W. Penfield & Son, Willoughby, O., make changes in their advertisement in this number—an omnibus "ad."

T. W. & S. H. Stanland of Summerville, S. C., have organized a brick and tile company with a capital of \$10,000.

The potter plant at Louisville, Neb., will be transformed into a brick and tile factory, backed by Omaha capitalists.

C. C. Sheldon, the energetic young brickmaker of Urbana, Ill., has put up an artificial dryer and will run all winter.

The Akron (Ohio) Brick and Tile Works are putting in a steam dryer, new machinery, etc., so as to run the year round.

The Jefferson (Wis.) Brick & Tile Co. are going to put in a new brick machine and make other improvements to double their present capacity.

Women employed at handling clay at the Columbia Tile Works, Anderson, Ind., have been seized with miasmatic poison from minerals in the clay.

The Central City Brick & Tile Co., Peoria, Ill., are in the market for a stone crusher for their brickyard, something

that will either crush or remove from their clay stone the size of a walnut down to a gravel. They have an excellent clay, if they can find a machine to remove the stone.

The Victoria Brick & Tile Co., of East St. Louis, has been incorporated, with a capital stock of \$15,000. The incorporators are George A. Taylor, George A. Smith and John P. Mehan.

The Adrian Brick & Tile Machine Co., Adrian, Mich., have a new "ad." in this number, illustrating more fully the improvements in their line of clayworking machinery. The next issue of the JOURNAL will have another illustrated advertisement showing other clayworking machinery manufactured by this firm.

The Old Dominion Brick & Tile Mfg. Co. has been organized with a paid capital of \$60,000. A charter has been applied for and the following officers elected: L. Sheldon, Norfolk, Va., Pres.; Geo. S. Oldfield, Vice Pres. and Supt., and Geo. W. Black, Sec'y and Treas. The company will manufacture brick, drain tile and terra cotta, at Sturgeon Point, on the James River. They have an abundance of fine clay, and with excellent shipping facilities they begin business very auspiciously.

SALT WATER BATHS.

Salt water baths are an excellent tonic; taken warm they are delightfully refreshing when one is heated or tired, and taken cold they are the best preventive in the world of too great susceptibility to colds. One delicate woman who used to insist that she "caught a cold on coming into the world and had never been without one since," became as indifferent to damp and draughts as a sailor after a year's trial of salt baths.

A VISIT TO THE STEWART BROS. KILN.

The several advertisements which have appeared in the JOURNAL in the past three or four months, together with the statement made by the Stewart Bros. that they have burned a kiln of 1600 eight-in. tile nested with six-in. and four-in. tile in a little less than 28 hours, including the water-smoking; further, that they had burned a kiln of 10,000 three-inch tile in 23 hours and 20 minutes from the time of kindling the first fires to water-smoke until the final fire was made to complete the burn; that the loss from the first kiln named did not exceed five per cent. and the kiln of three-in. tile did not exceed one per cent., have led to the denial of the possibility to burn tile in so short a time by those unacquainted with the facts.

The Stewart Bros. made the request that we should visit their works and see what has been done. We accepted their invitation and made the trip to Mt. Victory, Ohio, on the 24th of December. We were shown a portion of the two kilns of tile referred to, a part having been sold. They were certainly well burned, and the loss had been piled out in each case, indicating less waste than stated.

There are conditions, however, that are probably not so well understood which we give briefly. The clay is easy to burn and not seriously effected by raising the heat rapidly. The clay admits of making the wall of the tile thin compared with many that are made, requiring less time to water-smoke and burn. The kiln is so constructed that the heat with the air currents do not pass directly into the tile from the fire-box, but passes under the floor and up the sides of the kiln, thence passing down through the ware and out through the heat flues at

the ends of the kiln, so that there are no cold air drafts to strike upon the tile.

At the time of our visit, a kiln of three-inch tile had been opened through the centre of the kiln from top to bottom. The tile on either side were uniformly well burned. If they had been taken out of the kiln, we do not think that we would have been able to designate where the tile had been burned—in top, bottom or middle tiers. In water-smoking, the floor is warmed first, then sides of the kiln, so that the ware is not subjected to a direct draft of heat or cold air.

The Stewart Bros. are regarded to be reliable men in the community where they reside and from our personal acquaintance with them, it is our judgment that they would not wish to deceive any of our readers. They have what they, and others think a good kiln and would like to dispose of the right to use it to such parties as will likely be benefited in its use and to such only. They are practical tile manufacturers of much experience. At the time of our visit, parties were loading and drawing tile.

Messrs. Stewarts report that the present season's trade in tile is the best they have experienced since they have been in the business.

A CHEAP EDITION OF PRACTICAL FARM DRAINAGE By C. G. Elliott.

We have just from the press a cheap edition of this work (paper bound) which we offer at the following prices:

Single copy, by mail	\$.25
$\frac{1}{2}$ doz. copies " "	1.40
1 " " " "	2.75
1 " " " " express	2.50

There is probably no investment that can be made in the purchase of drainage literature that will be more helpful to those engaged in the underdrainage of their land than 25 cents (or less by the quantity) expended for this treatise on

farm drainage to be given to the leading customers of the tile works and those who ought to be underdraining. To do so is to build up the tile trade. We offer this valuable work almost at cost to give it the widest circulation possible. "But," even then, we cannot get some some people to do what they ought to do in their own interest. If some good soul gave them to the value of twenty-five cents, they would remember the gift as long as they lived. "But" they fail to apply the same measure to others.

Buy one or a dozen copies of this work and present a copy to those who are likely to appreciate the gift and await the result. Try it. Address

DRAINAGE JOURNAL,
Indianapolis, Ind.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.
GEO. L. PEARCE, Guineys, Va.

WANTED.

A good Tile Burner and some Ditchers. Address
F. A. TERPENING, Prairie Grove, Ark.

WANTED.

To purchase a good Brewer Mill and Crusher or Disintegrator. Address with price,

TILEMAKER,
Care of "Drainage Journal."

FOR SALE.

One Junior Westinghouse Engine, 15 h. p. Has been used for six weeks running a fan. For particulars and price, address J. W. PENFIELD & SON, tf. Willoughby, Ohio.

FOR SALE.

Tile Factory consisting of eleven acres of good land with excellent clay. One kiln; dry shed 220 ft. by 16 ft. One 18 h.p. engine. One Ohio Tile Machine, dies to 8 inches complete and in good running order. Also a good Wallace Clay Crusher and Elevator which have been used but one season, good as new. The Crusher and Elevator will be sold separately if desired and at a bargain for cash. This is a desirable plant. For prices and terms of payment, address
JESSE THOMPSON,
Selma, Ohio.

FOR SALE.

One Terre Haute Tile Machine, new.
One Penfield Plug, steampower.
One Enreka Mill.
These machines can be bought very low. Address
J. M. HEDGES, Terre Haute, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Hoosier Auger.
One Brewer Crusher, late pattern, nearly new.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN.
Portland, Indiana.

RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental
Designs, Paving Tile, etc.

BRICK MAKERS' SUPPLIES.

Tempering Wheels, Trucks, Moulds, Barrows, etc.
Send for circulars.

C. W. RAYMOND & CO.,
DAYTON, OHIO.

CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitrified Stone Sewer Pipe we
Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,

Cincinnati, O.

TILEMAKERS' SPECIALTIES.

"Reasons Why the Farm Should Be
Drained." 1,000, \$5.00; 500, \$3.00; 250,
\$2.00.

"Voice of the Tile." 1,000, \$5.00; 500,
\$3.00; 250, \$2.00.

Tile Sales Receipt Book, each book
containing 250 statements of sales with
stubs. One copy, \$1.00; 2 copies \$1.75;
4 copies, \$3.00.

Cards, Bill Heads, Letter Heads, En-
velopes, Statements, Etc. For prices and
samples, address D. F. BILLINGSLEY,
Indianapolis, Ind.



SALZER'S NORTHERN ARE THE BEST CROWN FOR ALL SOILS SEEDS AND CLIMES.

My White Bonanza Oats took the American Agricultural
Bureau \$5000 Prize, as the heaviest yielding Oats in America,
cropping 135 bus. per acre. Low Freights to all points.
60,000 BUSHELS POTATOES CHEAP.
Our Catalogue is the finest ever published. Send 4 cts.
for same, or 8 cts. for my Grain Samples, or 8 cts. for
my new 17-day Acme Radish and receive Catalogue free.
On Trial—35 pkgs. Earliest Vegetable Seeds, post pd. \$1
15 pkgs. Elegant Flower Seeds, postpaid, 50c.

JOHN A. SALZER, LA CROSSE, WISCONSIN.



"ACME" the new 17-day Radish.

**BIG
4
ROUTE**

The Shortest and most
Direct Route

**East, West,
North, South.**

Solid Vestibule Trains,

CONSISTING OF

**The FINEST COACHES, PARLOR, RE-
CLINING CHAIR, CAFE and DIN-
ING CARS; WAGNER COM-
PARTMENT, BUFFET and
STANDARD SLEEP-
ING CARS.**

**Heated with Steam and Lighted
by Electricity,**

FORMING

**The FINEST TRAINS in AMERICA or
THE WORLD.**

Its SUPERB TRACK and UNRIVALED MACHINERY
and EQUIPMENT permit the HIGHEST SPEED with
PERFECT SAFETY.

It is the only line which lands its passengers at
the GRAND CENTRAL DEPOT in the heart of the
great city of NEW YORK, which is an advantage of
NEARLY TWO HOURS in TIME OVER OTHER ROUTES

Its entrance into CHICAGO surpasses all others,
passing through the famous CITY OF PULLMAN,
along the LAKE FRONT, and the far-famed MICH-
IGAN AVENUE BOULEVARD, in full view of the
finest RESIDENCES and PUBLIC BUILDINGS. In
fact, its Connections and TERMINAL FACILITIES at
all points are superior to those of any other line.

Its trains enter the Central Union Station, CIN-
CINNATI; the Union Depots, CLEVELAND, BUF-
FALO and ALBANY; the Grand Central, NEW
YORK; the Boston and Albany, BOSTON; the
Union Depot, ST. LOUIS; the Union Depot,
PEORIA; the Great Central Depot, CHICAGO;
the Union Station, INDIANAPOLIS, and numerous
others in the vast territory it traverses between the
MISSISSIPPI RIVER on the west; the OHIO RIVER
on the south; the GREAT LAKES on the north,
and the principal SEA-BOARD CITIES in the east.

The Indianapolis Offices of this great line are
located at

**No. 1 East Washington Street,
138 South Illinois Street,**

and the UNION STATION, where tickets can be pro-
cured to all parts of the UNITED STATES and
CANADA and MEXICO, at the lowest current rates,
and full information as to routes, conditions, con-
nections, etc., etc.

OSCAR G. MURRAY,
Traffic Manager.

D. B. MARTIN,
Gen'l Passenger Agt.

H. M. BRONSON,
Ass't Gen'l Passenger Agent,
Indianapolis, Ind.

A NEW AND VALUABLE BOOK.

"Brickmaking and Burning," T. A. Randall & Co., Publishers, Indianapolis, Ind., price \$2.50. This is a handsomely bound and valuable work being a practical treatise on Brickmaking and Burning and the management and use of different kinds of clays and kilns for burning brick with a supplement for new beginners in that work and hints to bricklayers and builders. The author, J. W. Crary, Sr., is a successful brick-maker of many years' experience, and in this book has given in a plain, practical way, his views and experiences in all the details of the work. The book is a veritable storehouse of knowledge on the subject and should find a place in the library of every worker of clay. There is also much in the book of interest to architects and builders.

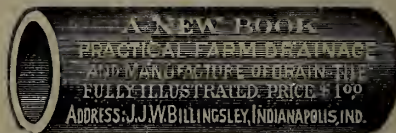
IMPROVED EXCELSIOR INCUBATOR



Simple, Perfect and Self-Regulating.
Hundreds in successful operation. Guar-
anteed to hatch a larger percentage of
fertile eggs at less cost than any other
hatcher. Send 6c. for Illus. Catalogue.

Circulars
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GEO. H. STAHL, Quincy, Ill.



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THOMAS P. SIMPSON, Wash-
ington, D. C. No attorney's fee
until Patent obtained. Write
for Inventor's Guide.



The I. D. & W. Ry.



Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.00 pm. (daily.)
Ar Decatur	2.45 pm.	3.50 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.10 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.85 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin, Bluffs and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, JNO. S. LAZARUS, City Ticket Agent. General Fr't and Tkt Agt.

MONON ROUTE

LOUISVILLE, NEW ALBANY & CHICAGO RY.

LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.

Arrive in Chicago 2.30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily.....11:10 a. m.

Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.

Arrive in Chicago 7:25 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday.....11:55 p. m.

Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily..... 9:55 a. m.

Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.

Arrive in Indianapolis 3:55 a. m.

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.

I. D. BALDWIN, D. P. A., Indianapolis.

JAS. BARKER. G. P. A., Chicago.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



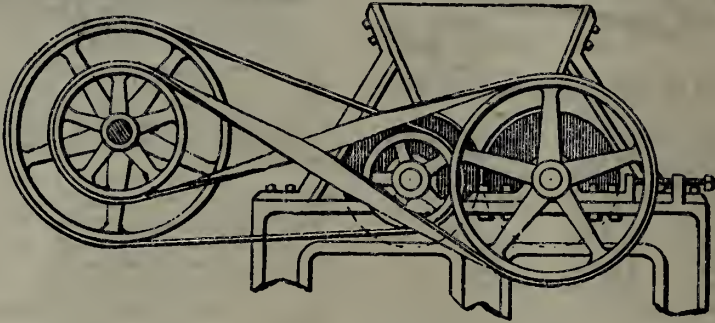
Manufactured by

MARION STEAM SHOVEL CO.,

MARION, OHIO.

THE Crusher and Disintegrator.

PATENT APPLIED FOR.



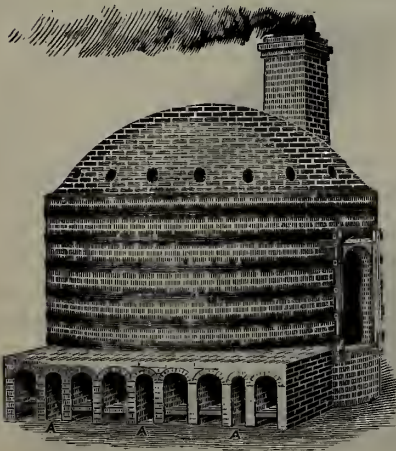
The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

W. H. WICKERS, Agent,

311 English Avenue.

INDIANAPOLIS, IND.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others, in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

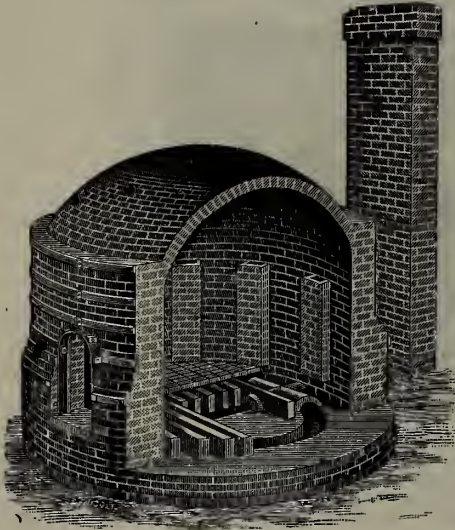
BOX 246, AYLMEER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.



"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT LEADS THE WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, and arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

→New and Improved Brick and Tile Kiln←

PATENTED JULY 31, 1893.

This Kiln is offered to the Brick and Tile makers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



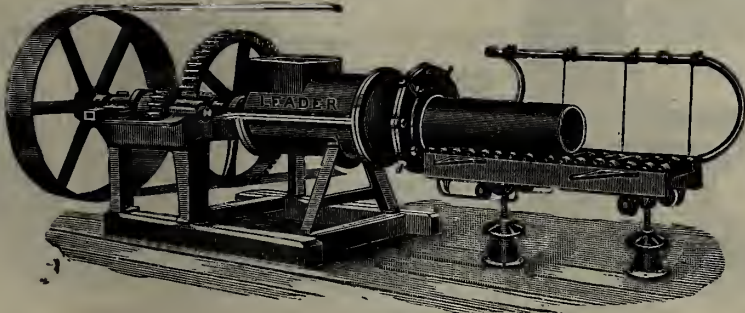
J. B. GRAWCOCK, Churubusco, Ind.

Brown & Frazier Manufacturing Co.,

PORTLAND, INDIANA,

—MANUFACTURERS OF—

Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,

Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR

CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



SECTION OF CONVEYOR.

ELEVATORS

FOR TILE,
BRICK,

PACKAGES, ETC.

Roller & Detachable

CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

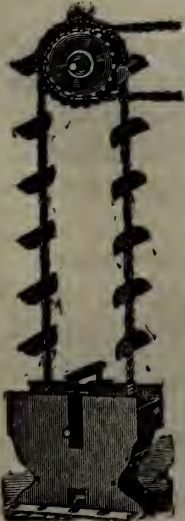
Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

ADDRESS

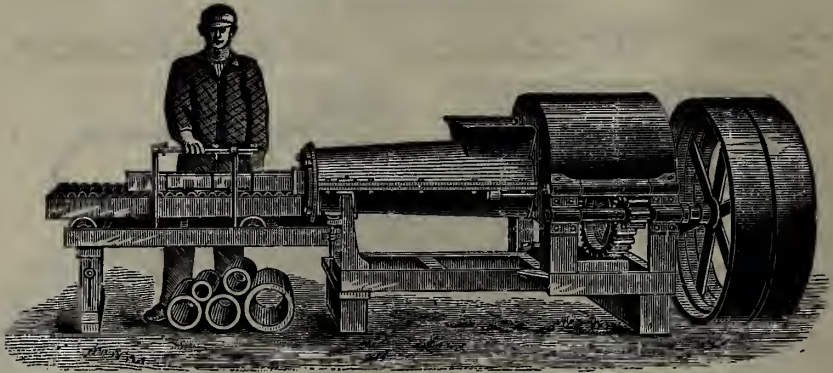
The Jeffrey Manufacturing Co.,

112 East First Avenue,

COLUMBUS, - - OHIO.



KELLS & SON'S IMPROVED
Brick and Tile Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no pressing for the first fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-two Years' Experience in the Manufacture of Brick and Tile Machines.

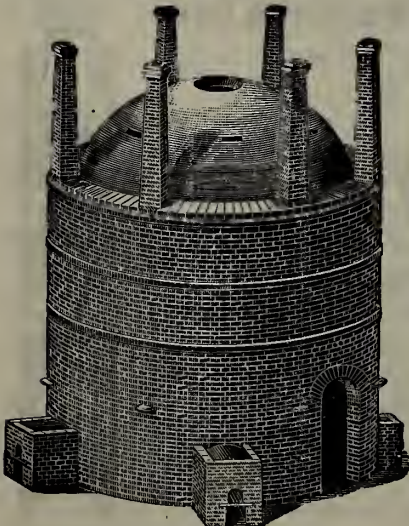
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 8 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

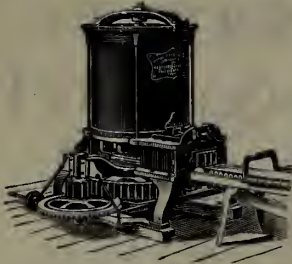
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

64 Johnson Building,

CINCINNATI, OHIO



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

Dry Cars;
Clay Cars;
Turn
Tables
and
Kiln
Castings.

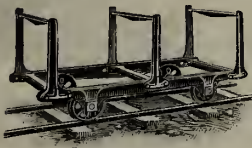


Pulleys;
Shafting;
Hangers;
Barrows
and
Yard
Supplies.

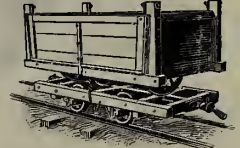
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



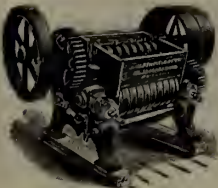
(Dry Car.)



(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.

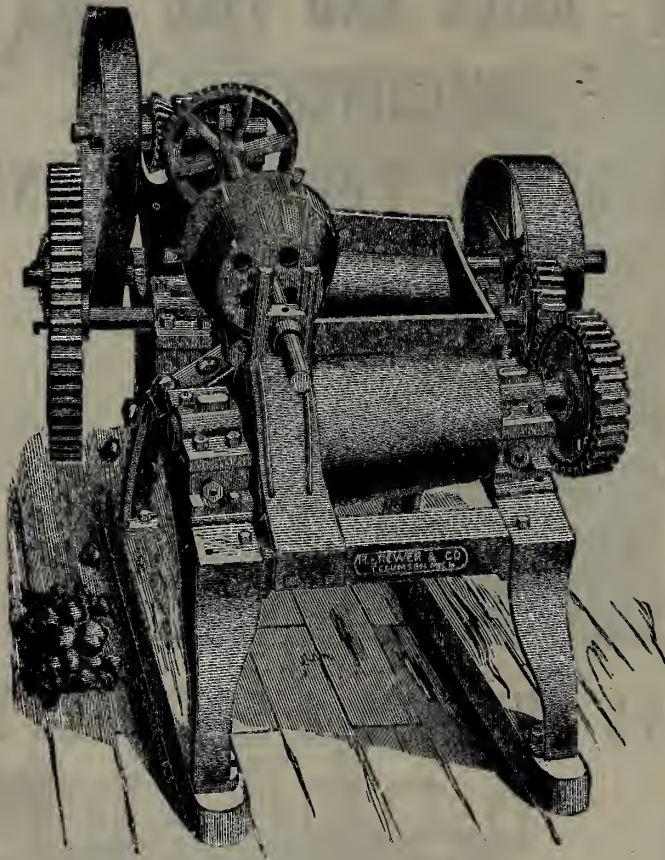


(No. 3 Crusher.)



(No. 7 Pug Mill.)

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

The following are among the advantages claimed for this form of construction:

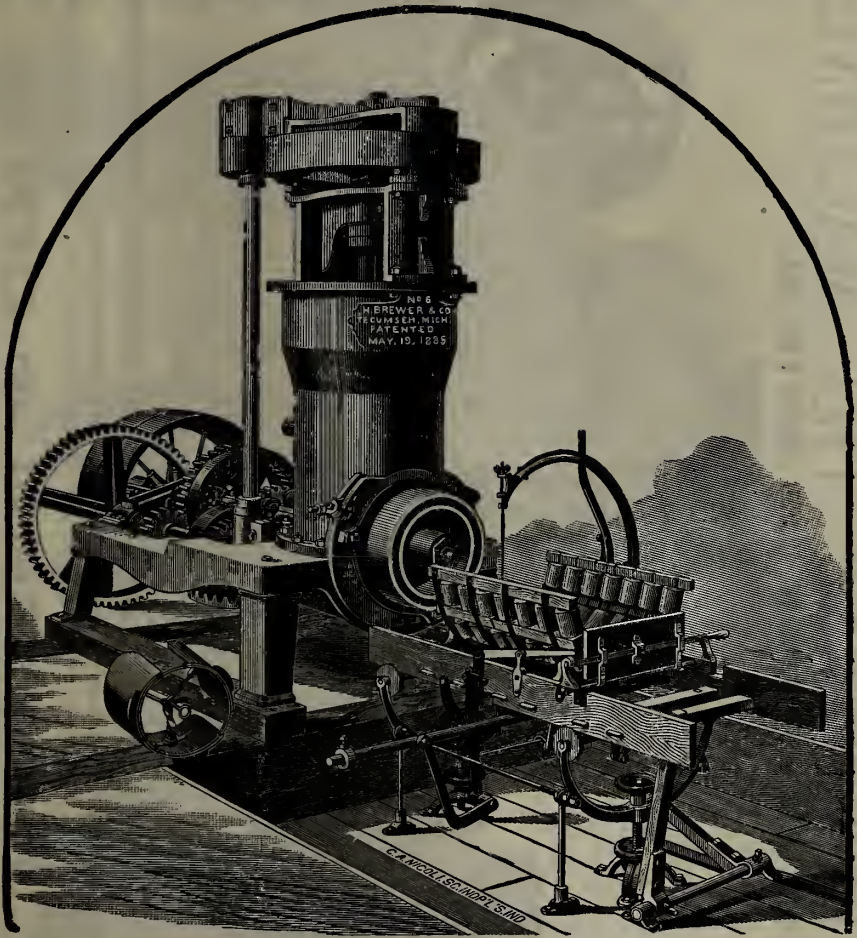
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no heads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

For circulars and prices of Crushers, Tile Machines or Brick Machines, address--

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile 16½ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, 16½ inches long.

Yours Truly, M. J. LEE.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

Yours Truly, JOLIET MOUND DRAIN TILE CO.

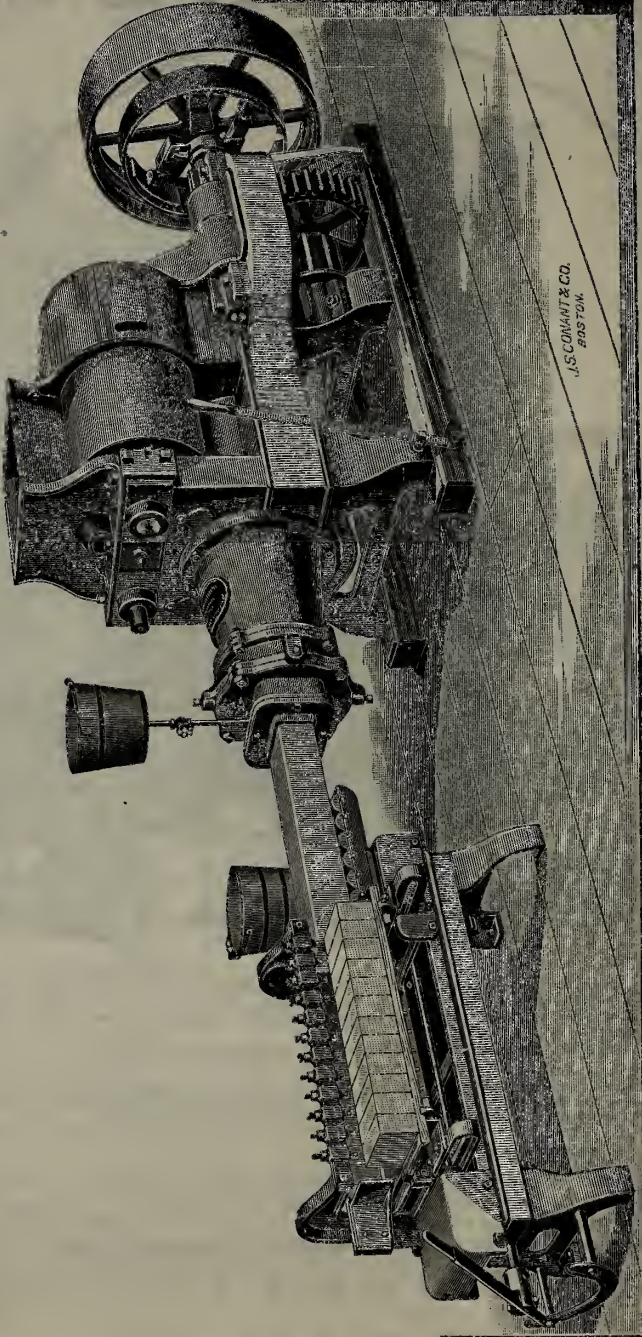
The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

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[Mention this paper.]

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FIG. 11.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

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The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

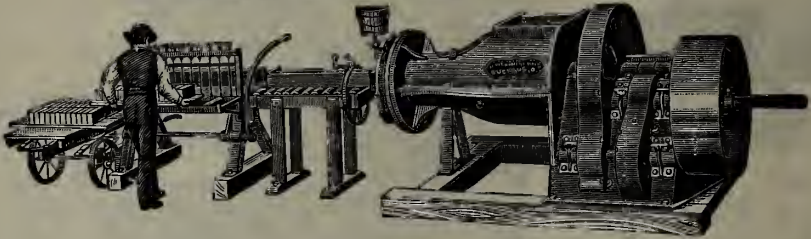
Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and $2\frac{1}{2}$ in my catalogue, the price would be \$60.00.

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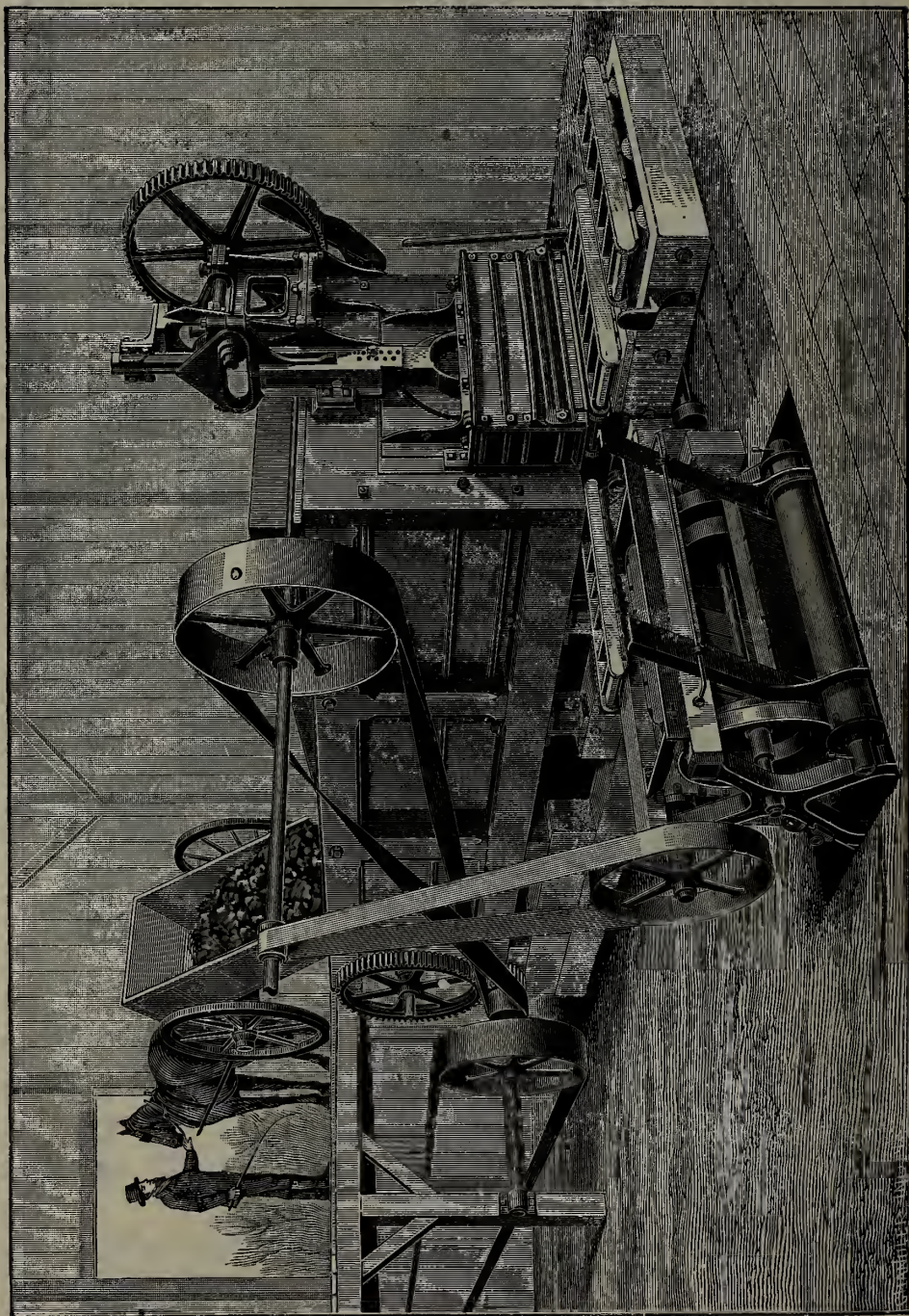
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It has the largest tempering capacity of any machine on the market.
All brick made have clean, smooth surfaces and sharp corners.
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Our Mould Sander, shown in cut, has taken the lead of all machines for this purpose. There is no place for the moulds to catch and cause delays. It will not spill or waste any sand. It is easily and quickly adjusted to any size mould.

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We are prepared to erect complete plants of any desired capacity and keep in stock a full line of **Brick Machines, Pug Mills, Disintegrators, Mould Sanders, Clay Cars and Drums.**
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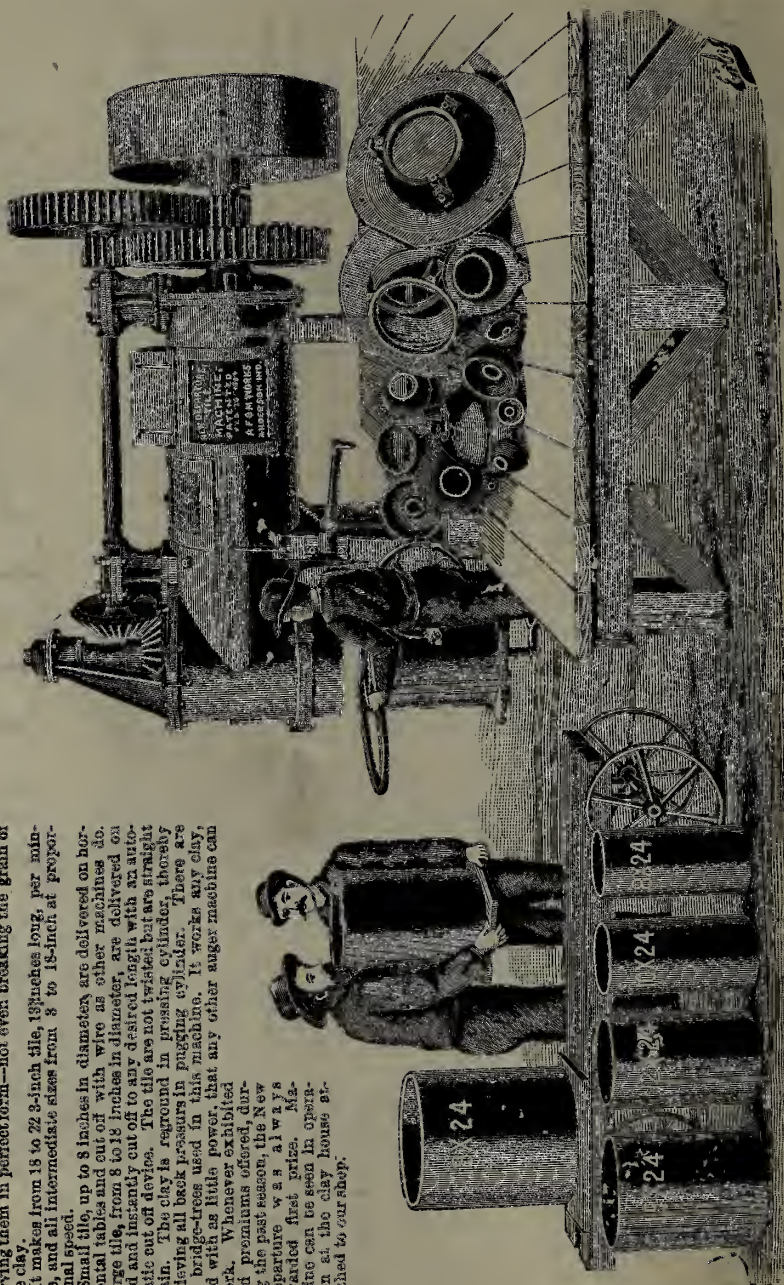
It makes from 18 to 22 3-inch tile, 13½ inches long, per minute, and all intermediate sizes from 8 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressures in puging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power, that any other auger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be used in operation at the clay house attached to our shop.

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Vol. XIII—No. 2.

THE DRAINAGE JOURNAL

FEBRUARY, 1891.

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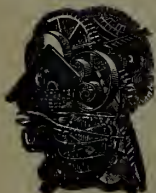
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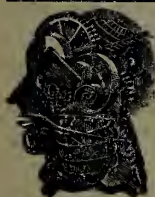
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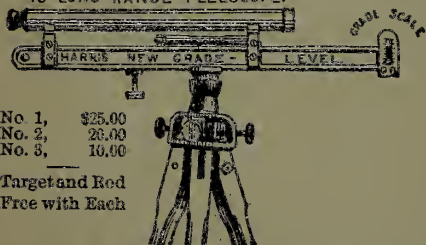
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THE DRAINAGE JOURNAL

Vol. XIII. FEBRUARY. No. 2.

VALUE AND IMPORTANCE OF UNDERDRAINAGE.

*BY J. B. BURRIS.

I take it that there is not a farmer before me who has not at some time observed the benefits and advantages derived from a thorough system of underdrainage. My subject then is of no speculative character, the effects of which you do not know or understand. No time need be wasted then in trying to convince you that drainage is an important factor in promoting agriculture.

If, then, I can impress upon you the value to be derived, and the importance of giving attention to this subject, the purpose of this paper will have been accomplished.

In this era of what we often have occasion to call hard times, when high taxes and low prices prevail and with poor prospects of bettering our condition for the future, it behooves us to use every possible means to make our cultivated crops as large as possible without impoverishing the land. Farming in its various phases must unquestionably be made a business that should receive the closest attention in order that the investment be made a profitable one. A desirable investment should be safe and give a fair return. Permanence is also desirable. Well done work in tile drain-

ing land may be counted more truly a permanent improvement than any other work done on the farm. Fire nor the action of the elements cannot destroy it. It is an investment that cannot be withdrawn nor is there cause that it should be. Experience has amply proven that in all ordinary cases the cost is fully returned in case of sale of the land. Even more abundant testimony clearly shows that the cases are exceptional in which there is not an annual return in the way of a goodly interest.

I cannot nor can anyone tell just what return will be made from a given expenditure in farm drainage, any more than I can say just what will be the return from a given investment in farm lands. In many cases drainage makes productive lands which before were worse than useless—producing nothing, or next to nothing, yet having cost something and yearly taxed. In some cases drainage may be done where the returns will be small. In some cases it will not pay, but these are rare.

No definite rule can be fixed as to the amount that can be wisely spent in draining land. This almost wholly depends upon the character of the soil and is a matter of judgment pure and simple.

I know of no work in which the farmer can engage where good hard sense can be used to such advantage as in this work.

Yet, fair intelligence, with a reasona-

*A paper read before the Putnam Co. Farmers' Institute, December 31, 1890.

ble effort to inform himself of the experience of others, will enable any farmer to determine, with reasonable accuracy how far it will be wise to invest in tile drainage.

The first land brought into cultivation in this portion of the State were the higher portions of those that were rolling or undulating. In time these became impoverished by cultivation of long series of crops and washings by rains, until to-day the flat lands are the most fertile we possess, and these to be brought into successful cultivation must be drained. Hence it is, that at the present time land considered almost worthless twenty-five years ago is to-day if drained the most valuable. The writer has in mind a tract of land upon which ten years ago during the spring months he shot snipe and wild duck. This same land produced the past season 50 bushels of corn per acre and has on two occasions yielded 80 bushels per acre. This has been accomplished too without excessive outlay for drainage, the entire cost being about \$8 per acre.

Now let us see what are some of the beneficial results of drainage. The following may be enumerated:

It removes surplus water from above and below the surface.

It enables the farmer to work the soil earlier in the spring and sooner after rains.

It keeps the ground moist and the crop growing in a dry season.

It makes the ground warmer and permits a more thorough pulverization of the soil.

It increases the fertility of the soil, and allows of a more thorough cultivation.

It lessens the risk of surface washings and freezing out of winter grain.

It increases the effects of manures by carrying down soluble substances to the root of the plant, besides lengthening the season of plant growth.

That some idea may be obtained of the amount of land that might be benefited by drainage, I make the assertion, without fear of contradiction, that twenty acres out of every one hundred and sixty of tillable land in this county could be drained at a slight expense, thereby increasing the annual yield of crops on this land fully one third. It takes but a simple calculation to determine the value of such an increase.

Were I asked to name one act that would add most to the wealth and material prosperity of this State, I would unhesitatingly say, the inauguration of a thorough system of drainage.

Fifteen years ago a tile mill was a rare thing. To-day there are nearly one thousand in operation in this State or nearly an average of ten to the County, more than is possessed by any other State. This represents an average investment per mile of over \$2,500.

There is no reliable data by which the amount of drain tile now in operation, or the amount produced annually in this State, can be obtained.

That the manufacture of tile is a considerable industry none will deny.

The report of the State Statistician for the year just closing reveals the fact that Indiana possesses 15,600,000 acres of land that may be cultivated or brought into cultivation. Of this amount fully one third is not cultivated, the greater portion being wet or swamp lands.

When it is remembered that by far the greater portion of this land is in the northern half of the State and must soon be added to our already large area of grain producing lands who can presume to know our resources.

Indiana to-day with a population in round numbers of 2,190,000 produces enough food products to sustain a population of 10,000,00 or nearly one sixth of the entire population of the United States.

With Indiana the center of population of the nation, with facilities of transportation in every direction, with untold natural resources of timber, coal, stone, clay, natural gas, and all that goes to make a great commonwealth, who will deny that the Hoosier farmer possesses advantages of which he need not be ashamed.

THE GOOSE POND MUST GO.

That wild, weird and historic spot in Greene County, Indiana, known as the "Goose Pond," will soon be transferred from a watery waste into fertile farms. A syndicate of Indiana and Illinois capitalists has been formed to drain this body of water, by which ten or twelve thousand acres of the most fertile soil in Southern Indiana will be made to blossom and bloom as the rose, instead of being the marshy bog, inhabited by reptiles, frogs and malaria, that it has been for years. By a careful survey it has been ascertained that a nine-foot fall can be obtained from a point near what is known as "Crane Resort" to Beaver Pond, on White River, a distance of six miles.

A GOOD FARM.

Charles Emerson lives on the home where his great grandmother moved, a widow of a Revolutionary soldier with six children, near the commencement of the present century. It contains 110 acres, 80 acres of tillage and a good sugar orchard. He raised 1,323 bushels of corn on 10 acres and 331 bushels of oats on 10 acres, had 75 tons of hay and 110 bushels of potatoes. He keeps 20 head of cattle, 150 sheep, 3 horses, 14 hogs and milks 10 or more cows, realizing some \$200 the past summer after paying expenses. The cost of carrying milk to creamery was nearly \$3. He hired a boy last summer, with one man extra in haying and corn husking. Now, is not that a good showing? He is a popular man in the republican party, having served in legislature and town business as did his father before him.—*Ex.*

Farm Drainage.



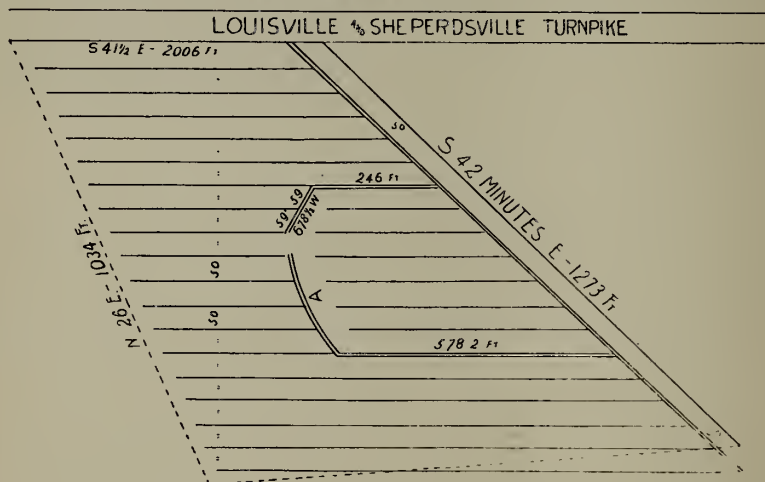
LAND RECLAIMED.

The accompanying diagram is a plot of a field of flat, wet, white clay land, abundantly supplied with crawfish, and, of course, very wet, or, when dry baked, very hard and untillable. This field had been cleared and cultivated as long as it would produce any crops. When fresh cleared, by plowing it up in lands or beds with the aid of open ditches it produced fair crops, that is when the season was neither too wet or too dry. But, for the last fifteen years, it had become so run together when wet or baked, when dry, it would produce nothing, not even weeds or briars, only some tufts of wild worthless grass. In fact, a good two story frame farm-house, and all the fences, were allowed to rot down, the ground being considered worthless, notwithstanding it was fronting on one of the best turnpikes, it lay well and was only three and one half miles from Louisville.

This field of near fifty acres is part of a tract of land I bought last May one year ago and tilled it during that summer, 1889. The plot shows the plan of the

drains. The main extending from the turnpike back more than a mile to get an outlet and was laid with 10, 8, 7, 6, 5 and 4 inch tile and were put in from four to six feet deep. The laterals run parallel to each other, and at an angle of about 45 degrees to the main, and are fifty feet apart and they are all of three-inch tile and are from two thousand to two thousand two hundred feet long, and were put in from three to four feet deep, as the surface made it necessary. I find the draining perfect, except at the upper end of main the water lingers longer

ment of the whole community, sowed it to wheat, a bushel and a peck to the acre. I drilled in with the wheat one hundred and twenty-five pounds of bone meal and seventy-five pounds of superphosphate mixed. The wheat came up well and grew with no water standing on any part of it, at any time, notwithstanding the excessive rains all winter and spring. And the severe freeze we had the first of March did not injure it as it did the wheat on other clay land not considered wet; but after the wheat was up, during the fall and winter I gave



than it should, the six-inch tile in the main should have extended all the way up, which I propose to do. A correspondent in the December number of your journal wishes to know how to get rid of crawfish. They have gone out of this field, at least they build no more "mud castles," in fact they were only there because the land was full of water, and if they had outlets for their channels would benefit the land.

In the summer of 1889 I had it broken up, rolled, disk harrowed, boarded, and harrowed until the immense hard clods were sufficiently reduced to make a passable seed bed. And then, to the amuse-

it a fair dressing of a compost of stable manure, land plaster and tobacco stems. In the last of the following February I sowed it to red clover, the freeze coming on just as the seed were sprouting. I had part of it to resow, but the clover came well and I do not know a better show of clover from last spring's sowing anywhere.

But, to return to the wheat, I had fifteen bushels per acre measured from the thresher and the ground surveyed by a regular surveyor, which was very satisfactory for this year, in fact the best land in this country, as a rule, this year, produced only from nine to twelve or thir-

teen bushels per acre. I know of but one farmer who got as much as sixteen bushels, and last year he got thirty bushels.

Considering the fact that the wet winter and spring, with the severe freeze the first of March, nearly destroyed the wheat on the best limestone clay land not underdrained in this part of the country, I had great reason to be satisfied.

The crawfish have left.

My object in buying and underdraining this land was to get tile draining started in this county. Just south and east of the city there is an extensive stretch of this wet clay land, beginning within from three to five miles of the city, extending back for miles, none of it productive and some of it worthless as it is, but I believe if properly underdrained could be reclaimed and some of it made first rate land, and the balance sufficiently so as to be useful and valuable. This region is familiarly known as the wet woods. In fact, much of it is still in native forest, and where it has been cleared up was permitted to go into thickets and second growth forests, because unprofitable to cultivate.

This land extends to my farm, a mile west, where I had done considerable draining and some of that drained the same kind of land, but that was not on the pike and the public did not see it, and farmers are slow to take hold of new things.

The most of my farm is black land and very rich, which was in the bed of an extensive pond covering some ten thousand acres of land, which was drained by a company, but which still overflows, sometimes injuring or even destroying the crops. Some of that I have underdrained with great advantage, because, as soon as the overflow subsides, the water is taken out of the soil—not remaining to heat and sour and kill the

crop. I have another field just across the pike, opposite the one above described, tiled last winter, sowed to oats in the spring, but the oats were destroyed by the little insect which destroyed all the oats in this part of the country.

I rebroke it in the summer and sowed buckwheat, and when the buckwheat was in full bloom this fall, turned the buckwheat under and sowed it to wheat which is now looking very fine and promising, but we will see next summer what it will do.

W. B. C.

TILING.

Those interested in agriculture and horticulture in our lovely southland will have to study the benefits of tiling, if they expect to keep fully abreast of this progressive age.

The farmer in Illinois and the States to the north of us have made rapid strides during the past few years in tiling their farm lands. The result has, in all instances, proved highly beneficial by improving the soil by perfect drainage, and a consequent increase in the crop grown.

With good drainage the soil is warmer and freer of water that would otherwise stand and sour and stagnate the land, delaying early cultivation.

There is no doubt but many of the complaints heard in regard to various diseases injuring and killing fruit trees, often originates in improper drainage. And I ask, in all clearness, if drainage is profitable to the wheat, corn and potato grower, why not, in all reason, be equally well for those interested in growing fruit.

Let us see what the answer will be. No doubt one reason no more has been attempted in the South than has at tile drainage, is the first cost of ditching and tile, there being very few tile factories in the country. To import tile from the factories in Missouri or Illinois would, I

admit, be rather expensive to the planter living in the Southern States, but like all business, just as soon as there is a demand for tile the factory will surely spring up to fill all demands that the farmer and horticulturist may need.

Again, some one may write to know what benefit there is in tile besides that of carrying the water off from the soil. To all of which I answer, the benefits are varied and many, but among the rest good tiling insures larger yields in farm products in extreme dry seasons, which fact has been fully demonstrated by the best and ablest cultivators in Illinois, and, good sirs, by far better crops grow on tile drained lands during extreme wet seasons.

Not only these two advantages, but the unsightly ditch is, when the land is tiled, forever laid away to rest, no more clearing of ditch banks and ridging each and every year, but a clean, clear field all the way through to greet the farmer's eye.

Some one may ask, "Is there anything to be gained in draining high, dry lands?"

To which I will say, yes. A hillside would produce a better yield of grass and finer pasturage for cattle or stock of any sort if properly tiled. "And why?" may be asked. Simply because the tile would keep the soil open and porous, permitting the fertilizers to find a way down to the roots of the plants to feed and nourish them during a dry spell. The tile would carry moisture into the soil for the young and tender roots to feed upon.

There is one sure way to arrive at the facts relative to tiling, and that is a practical test.

Commence with your garden. Tile it first. Put in tile three feet in depth, give two or three inches fall to the hundred feet in length, lay down four-inch tile thirty feet apart; be careful that the tile have free and open discharge. Once

you have this much accomplished, you need only wait a season or more to proclaim, which will be done, the good results of tile in the garden.

There is no use to hide the facts. The South is going to be the country. There is no mistaking this or trying to get around it. The growth and intelligence of the people will bring it all about. For this very reason the Southern farmer and fruit grower should study the various phases connected with their business, and as occasion happens, take a sly look into the advantages of tiling, so to keep posted.—*W. in Southern Agricultural Journal.*

THE DRAINAGE SYSTEM OF LOUISIANA SUGAR PLANTATIONS.

BY F. L. DELFER.

I first wish to state that the quotation from the *Sugar Bowl* in last number of the JOURNAL were rather misleading, as it conveys the impression that the average untiled land on this, the Armant plantation, gave only 22 tons of cane per acre, while the tiled land gave 32 tons. The latter is correct, but it is also a fact, that a great deal of the untiled land gave as much as the tiled land. The marvelous yields of 40, and even 50 tons of cane per acre, which have been obtained in some cases on single fields on different plantations, were all raised on untiled, but well open ditched land. Open drainage, as practiced here, is as near perfect as it well can be, and as expensive too, and in the end will be replaced by tiling, but the mass of the planters are not in any hurry whatever about making the change. In this connection it may be interesting to state, that the authors of the two different essays on drainage, which the JOURNAL copied some time ago from the New Orleans sugar papers, were planters who have not a foot of tile on their places; but their plantations are

acknowledged models for open drainage, and in every other respect.

If you place a checker board on a table before you, place a few peas under the end next to you, to raise it a little, mark that side Mississippi, and the lower edge swamp, you have a map of the average sugar plantation. Or, in other words, a plantation generally fronts on the river, and runs back to the swamp. Each square on the checker board represents a field of 10 to 20 acres, and is bounded by a road on each side. The roads run parallel to each other, lengthways and crossways of the plantation, about 800 to or 1,000 feet apart. The fields will generally average about four acres square, which would give 16 square acres to each. The standard of distance measure down here is the "acre"—210 feet. The ditches which run from the river to the rear, are called leading ditches, and on a well drained place they are about half an acre apart. They are about two feet deep, six feet wide on top, and one and a half or two feet on bottom. The ditches on each side of the roads, that run back to the rear, are generally deeper and wider.

On a few places the leading ditches run back through the whole place, which makes them sometimes a mile or two long. But on most places there are cross canals, or headland ditches, connecting the road canals, every few blocks, and the leading ditches empty into these. At the edge of the swamp all the canals empty into one or more swamp canals "which take the water to a bayou," or it stops in a low part of the swamp and the water finds its own way to the bayou, and through it to the Gulf.

Many plantations are so low in the rear that the water does not run off sufficiently, and it is then pumped out by means of a big water wheel, or a powerful pump. It takes one quite a while

till the oddity of the thing wears off, to see the water run away from, instead of into the Mississippi. As far as drainage is concerned, there need be no Mississippi for this part of the country. It comes as near draining it, as one would come to catch the rain of the roof of the house by placing the gutters on the ridge, instead of the eaves. If it was not for the benefits of navigation this country would be vastly better off, if there was a strip of timber growing where the Mississippi flows. For although it is the best part of the year well down in its banks, it is a terrible neighbor when it raises out of them to the top of the embankments that surround it.

St. Patrick, La, Dec. 21, 1890.

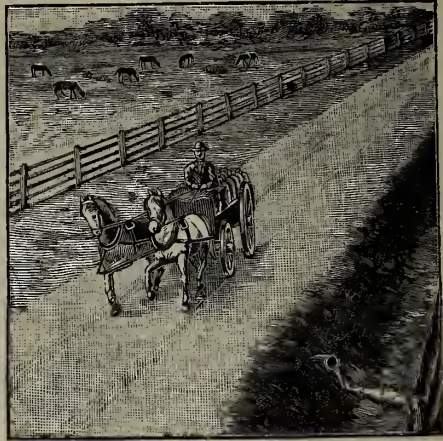
(To be continued).

LAYING UNDERDRAINS IN WINTER.

It is not generally thought that this work can be done in winter to advantage, but nevertheless it can, says W. D. Boynton, in the *National Stockman and Farmer*. If proper preparation is made in autumn it can be more economically carried on in the milder weather of winter than at almost any other season. Men can be had for less than half the wages of summer season in many sections of the country where agriculture is almost the sole occupation. Many of the common laborers that have worked on the farm through the summer would be glad to stay through the winter for their board and common work clothes. The days are short and but few hours, even in pleasant weather, would be spent in the field each day, and of course in stormy or severely cold weather nothing at all would be done in the field, so that the farmer hiring by the month could not really be expected to pay very large wages. The preparation spoken of in autumn should be something as follows: Before the ground freezes the drains

should be located and furrows thrown out with the plow along the proposed lines. These should be run straight and true, throwing a furrow both ways, afterward going through with the plow set to its lowest depth to deepen the trench as much as possible. I have carried it down to a depth of 9 inches in this way, and it can be easily put down to a foot. After this is done, haul coarse, strawy manure and fill the trenches so made, so that they will not freeze. When the digging commences this filling may be removed as fast as the digging progresses. Underneath the manure it will not be frozen at all, and but little along the sides. This may easily be cut through with an old ax, and is really a benefit to the digger, as it holds the sides from caving in on him while lowering the trenches and laying the tile. This manure used in the trenches will come into play the next spring to mix with the raw earth that comes from the trench. In digging all these trenches care should be taken to have the top or good earth thrown to one side, and the raw subsoil to the other. Of course these cannot be completely separated with the most careful management, but so far as possible it should be done. I have often noticed that more digging is done than is actually necessary. The trenches are dug wider than need be, and more pains is taken to make the sides straight and smooth than the nature of the work requires. If long-handled spades and scoops to clean out and form the bottom of the trench are used, the trench may be made very narrow indeed. It will pay to have these tools as they expedite the work wonderfully. Don't put off draining from one year to another, waiting until time can be gained for the work during summer season, but carry it on in winter, while the crops will not be at all interfered with, the weather is cold and labor is cheap.

Road Drainage.



THE SLOPE OR INCLINATION OF ROADS.

Roads should be made as nearly level as the earth surface will allow. If it is not the inclination will require additional strength to lift in part the load in going up the ascent. It has been practically demonstrated that a perfect road surface having an inclination of one foot in every twenty of its length a horse drawing up it a load of twenty hundred has to lift one twentieth part of the load besides the friction.

The effect of increasing the inclination is very clearly illustrated in an address of E. C. Jordan, as follows:

"Load a wagon or a horse car with all the weight that a horse can draw on the level road or track; for the purpose of illustration call it twenty persons. If you start up a hill rising two feet in a hundred, two people must get off; if the hill is three in a hundred seven people must get off; if 5.4 in a hundred, which is about the grade of many hills on our common roads, twelve people must get off; that is, a load representing less than one half the drawing capacity of the horse on level ground, is the amount

that he can pull up hill. You may seemingly remedy this by extra horses but it is a decided item in the expense account. In practical operations only three-fourths of a load is put on, and the rest is taken out of the horse by calling on him for extra exertion: this he cannot respond to for the whole day or on a long slope though he may for shorter distances."

A load has to be drawn a distance of five miles. The road is level or has only slight inclinations, except one long hill having an inclination of one foot in twenty feet, only one half of a load can be drawn. The steep grade of one hill may occasion great loss to a community, and yet how few think or do anything to lessen the obstruction.

THE SURFACE CONDITION

of a public highway is a vital question to the traveling public. A load that can just be drawn on a hard, smooth, level, iron roadway, will require two horses to draw it on a good, common, hard roadway, and four horses on a common roadway, and double the four on a sandy road.

A short time since the writer hired a livery team to drive to a small town three miles distant, the roads had been frozen and then thawed on the surface. The liveryman said, "It will be better to drive via of the gravel; it is three miles further, but the road is good, and we drive the five miles in probably half the time that would have been required over the bad road with less damage to the horse and vehicle." It was a pleasure to make the trip over the good road, and the other way we would have been tormented. The direct road would have been the traveled route if alike good, but, as it was, it was avoided, except by those living along the line of it; they were compelled to travel it. A farmer on a good road ten miles from town

frequently makes a much greater profit than his neighbor, who is much nearer on a poor road that compels him to haul only a half load.

Correspondence.

Believes in Drainage.

Editor Drainage Journal:

Yes, sir, I want the JOURNAL next year; cannot afford to not have it. It has been a comfort and great advantage to me. Since last April I have purchased 19,000 tile, more than half of which have been laid and the balance to go in as soon as the weather will permit. We are still making what for the *present* will be open drains; were kept back last spring by the wet season, but got in 8,000 pieces by July, on farm of 214 acres. The results were so satisfactory I increased my order 11,000, making above amount; 3,000 of the last order we got in this fall.

On a field of 25 acres we put 114 rods and sewed to oats, which started and looked well all over the field until injured by the almost constant, heavy rains and *probably* the influence of *hot* suns shining on it *immediately* after showers, which in this part of Pennsylvania greatly damage our small crops, but our crop recovered sooner than others and resulted in a good, heavy crop of oats. This same ground was sowed with wheat. Besides the pleasure of working this drained land over previous years, if we may judge from present appearances, we will realize at least 5 bushels per acre more than before drained. 4 bushels increase per acre will fully pay all expenses.

We had two pieces of swamp land that was not safe to drive a team over; about 3 acres in each. They were plowed as soon as ditchers got off and sowed with buckwheat, one field July 3d, the other

July 17th, quite late. We got 85 bushels from the first and 73 bushels from the other. The last was wiped by frost, just about paid whole expense of draining. The land is now dry and in good condition to farm.

We laid the tile 31 to 54 inches deep, depending on the depth to slate and other subsoil; used 2 to 4-inch tile; had from 6 to 36 inches of fall to 100 feet and was all put down with the careful use of the Harris Grade Level.

Our aim thus far has been to cut off springs and the water thrown out by the close approach to surface of solid subsoil. We have been greatly surprised to see how much soil will be made unfit for use by a stream that could be carried off by half inch tube and less and also of soil leached by the thin flow of water thrown on surface by the approach of slate or hard substance to surface and as most of the water has to get away by evaporation, causing cold feet to roots of vegetation, leaving them too delicate to stand the drying and hardening of soil that usually follows, and further at the small amount of tile necessary to carry off this outflow if properly located.

When we get through next spring, shall have at least 50 acres more of favorable land. By properly caring for soil deposited by the long flow of water, it will be the most productive. The average cost per rod will be 74 cents. I am satisfied the increase in one round of crops will pay all expense. Whilst the four miles of drains cost me near \$1,000, where can any other investment be found to pay whole principal and interest in three years and then continue in that ratio at least.

J. A. F.

Bloomsburg, Pa.

"Kind Words" from a Friend.

Editor Drainage Journal:

Enclosed find one dollar for a renewal of my subscription for the DRAINAGE

JOURNAL. I cannot give it up, although I cannot say why I take it, only for the many common sense ideas it contains. I am getting well advanced in years, still I find the fire within me has not wholly left that prompted me to push business in my younger days. I like the JOURNAL; read it the first thing when received.

I take two daily papers, one morning and one evening, besides two weekly papers. I would sooner drop either of them than the DRAINAGE JOURNAL.

S. S. EATON.

Wants to Know About Draining Peat Land.

Editor Drainage Journal:

I want information in regard to draining peat land for gardening purposes and especially with a view to the cultivation of cranberries. Thinking it quite probable that such information may be found in some former numbers of your journal such information may be found. If you do not have what I want, send the JOURNAL to me as a subscriber and I will solicit answers from your correspondents.

E. C. NORTHEY.

Stillwater, Minn.

Agricultural.

IT WILL PAY TO BE A FARMER IF WE FARM RIGHT.

The latest we have seen on the subject comes from Hon. John W. Bookwalter, of Springfield, Ohio. He says:

"We are now able to export a surplusage of breadstuffs and other food enough to supply only 5,000,000 people. All the rest that is raised out of the ground is consumed by our 63,000,000 or more of Americans. At the present rate of the increase of our population, and considering the stoppage of the supply of new land, we ourselves shall in six years eat

everything that we raise in the country. This is so inevitable that there is going to be an increase of the farming population; it is going to pay hereafter to be a farmer. When we have no surplus to export, the world still desiring to partake of our crops, the prices must go higher, and I think that the farmer, after having had a few years of low prices, is going to have good rates speedily."

It will pay to be a farmer provided, however, we get out of the old grooves and quit trying to always take out of the meal tub and put nothing in. We must thoroughly underdrain our land, then learn the art of saving and using manure; how to rotate crops with clover; how to turn under heavy crops of clover and get our money back in crops of wheat yielding 30 or 40 bushels per acre and other crops of like excellence.

Scratching over clayey fields for forty years without giving the soil any chance to recuperate or make any return to it whatever, will surely not pay under the most favorable prices. The sooner we awake to the fact that first of all the soil should be put into the best mechanical condition by underdraining and then add the needed fertilizers and brain management, the better. No legislation or farmers organization is going to make us rich unless we meet the wants of our business and exercise a modicum of common sense. Switching us off into one party or the other, or into a "third" or "fourth" party, will not bring back used up fertility of the soil. It takes well directed, intelligent effort.

FARMERS PROGRESS.

In this day of organization among farmers, if we hope for good and beneficial results we must go at it in a business way. The farmers gathering must be an educational factor that will equip him, making him a better farmer, better

citizen, better business man and a hustler who has been educated by contact with his fellow farmer and the world which will give him knowledge and a breadth of understanding that will make him proud of his calling and not a football for politicians. Equip him with these capabilities and practicabilities and make him an educated man of the world, build him up into a thinker instead of a follower of vagaries and non-essentials and you will have so fitted and prepared him that he will lead and have a following, too; not because he is a farmer but because he respects his business and is level headed and has extended his horizon, and this alone will place him side by side with business and professional men in legislative halls and places of trust, for merit in him will be recognized as well as in those of other vocations.—*W. H. Morrison, Superintendent of Wisconsin Farmers' Institutes.*

COVER THE BARNYARD.

Covered barnyards are now becoming the rule. The barnyard is open on the south side but the other sides are well protected, the roof being made watertight. Such an inclosure gives the stock an opportunity to secure fresh air without being exposed. The plan may appear expensive at first, but it saves food. Cornstalks, leaves and other litter are used to make manure and the manure is also protected from injury.

Mr. T. B. Terry of Hudson, Ohio, recommends such a covering as economical in the saving of feed and manure as well as contributing to the comfort of the stock. The cost of such a covering for 65 by 100 feet, Mr. Terry reports as \$300. The saving and feed and manure alone would soon repay the cost. The loss from the leaching of manures and the washings of the barnyard is much greater than is usually estimated. In fact, there are few farmers who take any notice of the loss.

Tilemaking.



THE ILLINOIS CONVENTION.

The Illinois Brick, Tile and Drainage Association met in Art Hall, in Springfield, January 13, 1891, the president, T. D. Spalding, of Gibson City, presiding.

After completing the roll of members, the following reports were given by members present:

Wm. Hammerschmidt—Makes both brick and tile; trade good.

J. T. Parr—Trade good.

C. Solfisberg—Makes brick; demand and prices good.

Egan & Moore—Our trade in tile has been much better than last year.

A. Curtis—Trade good.

W. H. Stoutenborough—Tile sales good; demand is mostly for large tile.

M. E. Donahue—The dry season has seriously effected my trade.

C. F. Tenney—Season has been so dry as to make sales poor.

Connor & Patten—Trade good, especially so in large tile.

Central City Brick & Tile Co.—Have had a successful trade in brick.

J. H. McCabe—My trade has been good.

J. E. Grunsdall & Co.—We are new

beginners in the business but our trade has been good so far.

F. Lawrence—The season has been dry but sales of tile have been fair.

Erwins & Snyder—Our tile trade has been better than for years.

Martin Bros.—We have seldom carried any tile over; trade good.

J. F. Snyder—Sales good; better demand for tile than for years before.

Reid & Capp—Make brick; demand good; prices satisfactory.

A. Jordan—My trade has been better for tile than for years before.

Pike & Castle—Our trade has been good, especially for large tile.

Frey-Sheckler Co., represented by Mr. Farnham, reported sales of machinery very good.

Eggleston & Spaulding—Our trade has been good, notwithstanding the dry weather; in fact our farmers are so fully convinced that underdrainage protects against damage by drouth, that they tile the more, seemingly; our supply has all been taken and we will have to ship in tile to supply our trade until we get to making in the spring.

Stiles & Co.—Trade very good.

H. Brewer & Co., represented by Mr. Chambers, reported a very satisfactory trade in machinery the past season.

John McCabe—The demand for glazed tile has been better than for years before.

H. Dawson, Sr.—Make brick and tile; have made one and a half million the past season and have not been able to supply the demand.

G. C. Stoll—Have had a surprise in the tile business this year; it is far beyond my expectation.

E. A. Stare—Have had a very good trade; have made one and a half million tile and have sold about all.

Gooding & Stookey—Our trade has been better than for many years.

J. C. Robinson—Make brick and tile;

business has never been better with us.

N. F. Swartwaut, of the Dixon Brick & Tile Co.—Have had some trouble in our trade with bricklayers on account of the roughness of our brick. Our country does not demand much tile on account of it being rolling.

George Gillen—I have been unable to supply the demand for both brick and tile.

John H. Stewart, representing the Stewart Brothers tile kiln, was introduced to the Convention.

GENERAL DISCUSSION.

Mr. President—Many of the farmers come in and say that they have tiled their wet land and now they find that what were their dry lands have become their wet lands—that now they have to tile these lands also.

J. F. Snyder says, that it is his experience, that the corn grown on underdrained lands the past dry season has yielded 40 bushels per acre and lands not underdrained have yield only about ten bushels. This fact is waking the farmers up.

Wm. Hammerschmidt, G. C. Stoll, E. M. Pike, C. Solfsburg and H. Dawson, Sr., were appointed a committee to arrange programme for the next annual meeting.

C. M. Walker represented the interests of the Adrian Brick & Tile Machine Co., reporting an excellent trade the past season.

G. E. Drennan represented the interests of E. M. Freese & Co., of Plymouth, Ohio., reporting a good trade.

Adjourned to 2 p. m.

AFTERNOON SESSION.

The president, T. D. Spalding, read the following

ANNUAL ADDRESS:

Gentlemen of the Convention:

We are again assembled together in this our thirteenth annual Convention, and what an eventful thirteen years they

have been. One can hardly realize what has been accomplished in the way of tile drainage—drainage of public highways, brick paving, improved machinery for making both brick and tile, improved methods of drying and burning ware during these years.

As an educator of public opinion these tile and brick conventions, which have been held here and in adjoining States during the last dozen years, taken in connection with the clay journals, have accomplished a wonderful work, for all those questions pertaining to the use of tile and their effect on different soils throughout the State, the tiling of hill-sides, the laying of tile through beds of quicksand, the tiling of the public highway and the way to lay them to accomplish the best results, the paving of our streets with brick and the best way to lay them.

All these questions and similar ones have all been discussed time and again at the different conventions and the discussions published by the clay journals and scattered broadcast over the land.

Who at this time can begin to estimate the harvest from the seeds thus sown?

Thirteen years ago the utility of tile drainage, the drainage of public roads, the use of brick for paving purposes, were considered as experiments, to-day, thanks to the persistence and perseverance of the brick and tile makers, these questions are established facts.

And yet most of the tiling done in the State of Illinois has been done since our first convention was held. At that time there were but few tile factories in the State and a large number of them running by horse-power, and only during a few months of the summer, to-day they are numbered by the hundred, and nearly all run by steam, many of them immense plants, running summer and

winter, drying by steam or hot air, and turning out tile by the hundred carloads.

And during these years we have seen nearly every acre of land that has been well tiled more than double in value, and, while we have seen the ground into which our tile has been laid increase in value over 100 per cent., we have seen the price of tile decrease nearly 50 per cent. during the same time.

And to many of us what an experience meeting these thirteen years have been. Many of us had very crude ideas about the first cost of a tile plant and still cruder ones about the enormous profits to be gained in running one. "No material required, except a little clay, which could be dug up in almost any place. If we could only manage to build a tile factory surely we would be independent in a few years."

Such were some of our dreams before we commenced work, with a ten horsepower engine where we should have had a twenty, using a six inch belt where we should have had an eight inch.

And then the experience we had when we came to drying—too much wind—not enough circulation—more ventilation—mix in sawdust—to say nothing of salt, grease, etc., etc.

Such was the advice we received from some brother tilemakers who had been over the same route a few months in advance of us.

And then when we came to building kilns! Talk about the "Mistakes of *Moses*," they were mere trifles compared with the mistakes that many of us made when we built our first kilns and *tried* to burn our first tile. *Mistakes* and *failure* were the rule, success the exception. And yet I sometimes think we learn more by our failures than by our success. The brick or tile maker who has always had a clay free from lime pebbles and that would dry without cracking, knows but

little of the trials and tribulations of some of us who have not been so fortunately situated. As the mariner on mid ocean takes his bearings to see where he has been drifting, so perhaps 'tis well with us to meet together once a year and compare notes, and take our bearings and see where we have been drifting during the last year. Are we making just the same kind and quality of brick and tile we were a year ago, or have we been making some improvement? The fact is we must improve and go forward, or go backward, for in this age of steam and electricity and human activity, no man can stand still. He that does not attempt to improve and forge his way to the front will soon discover that he is falling to the rear farther each succeeding year. The demand of the times is not for cheaper brick and tile but for better ones if it is possible to make them.

The country is flooded to-day with manufactured goods of all kinds that are practically worthless, simply because the parties manufacturing them were striving to see how *cheap* they could make them, and so well have they succeeded that their goods are dear at any price. The architect who is to erect a modern building 12 to 18 stories high does not scour the country to see where he can buy the *cheapest brick*, but, where he can get the *best ones*. The manufacturer who has learned to make the best brick or tile that *is* made has performed a far greater service to mankind than he who has simply learned how to make the *cheapest brick* or *tile* without regard to quality. To see that great improvement has been made in the quality and durability of *brick*, one has but to compare the paving brick made by some of the members of this Convention with the sidewalk brick laid a few years ago in this the capital city of the State. To-day such brick could not be sold for paving

at any price. While ten years ago but few brick had been used for paving purposes to-day several cities are using nothing else, and nearly every city throughout the State are using more or less of them, and to-day it looks as if *brick* was to be the paving material of the future in this country.

Terra Cotta in its various forms, another product of clay is another profitable industry, the demand for which is increasing each succeeding year. Another clay industry which seems to offer good returns for the investments made by some enterprising brick or tile maker would be the manufacturing of roofing tile and one where the demand would be almost unlimited. A few years ago I received a letter from Baltimore inquiring if I made roofing tile, and wished to know the price of same delivered at Baltimore, saying there was a good demand for all I could make. In this age of fire-proof buildings there is a demand as yet unfilled for *indestructible fire-proof* roofing material. I trust that some member of this Convention may be the pioneer in undertaking to supply that demand. During the sessions of this Convention there will be several interesting papers read before you pertaining to some branch of the manufacture or use of clay products in its various forms, all of which I hope will elicit a general discussion of the subjects treated upon.

In conclusion allow me to invite each and every member to take a part in the proceedings of this Convention. If we should all sit and listen, we would have a very uninteresting Convention. If you have had any trouble with any branch of your business don't hesitate to ask the Convention for the remedy.

The secretary, G. C. Stoll, read a paper, subject: "Underdrainage of Farms and Highways," written by C. W. Maynard, of Chicago, Ill. [Will be published in

a future number of the JOURNAL.]

In the discussion of the paper E. M. Pike said:

"I differ with the writer of the paper in his statement that tile should not be put in without employing an engineer. There are many farmers and others who can lay tile as well as an engineer."

Mr. Gooding—In order to introduce the use of drain tile where none had been used before we began to make tile, we purchased a drain level, and, with a little effort, we soon learned how to lay out drains, set the stakes for the farmers, and the result is that we have had but few mistakes in laying tile. By getting a copy of Elliott's "Practical Farm Drainage," and taking the DRAINAGE JOURNAL, a person can soon learn to do the engineering necessary.

Mr. Martin—I favor the employment of engineers where there is any work worth doing. The work can be economized by an engineer, to the extent of the cost of his service, in the use of sizes of tile only necessary to carry the water of rainfall; in the selection of the better lines to lay the tile; by securing regular fall, and consequently the better working of the drains.

Mr. McCabe—The tile are laid in our section of the State without the use of engineers and we have had no trouble. Our leading farmers have their own levels, and have no need of engineers.

Mr. Stoll—In our section we are doing a good deal of road draining by the use of tile, and our commissioners do not think of having the drains put in without the supervision of engineers.

Mr. Stare—On the Sibley farm of 23,000 acres the land is very level. Quite recently we have had to take up a long line of tile because of the want of skill in laying the tile, without any engineering skill. Now we employ the services

of an engineer to lay out the drains.

Mr. Hammerschmidt—I believe the saving by the services of an engineer will pay the expense.

Mr. Connor—Where we have tiled our roads they have been a success.

Mr. Pike—The idea of grading roads without tile draining them is a nuisance. The old surface is better without grading them if they do not tile them.

Mr. Gillen—We go one better in this, Sangamon County, we work the roads in the fall of the year. [Laughter].

Mr. Spaulding—The man that will work the roads in the fall of the year ought to be put in the penitentiary.

Mr. Farnum—The underdraining of the highways in my county has proved to be a success.

A paper was read by Henry Dawson, of Springfield, subject,

"PAVING BRICK AND THEIR PROTECTION."

In the condensed article presented herewith we shall not presume to enter into a discussion of the manufacture of paving brick, nor recommend any particular plans for the simplest and cheapest plans of producing them, but will confine ourselves to the necessities of the manufacture, in producing some means to protect himself from losses that are liable to occur to him after he has found a market for his manufactured material.

The present tendency to the use of burned clay for paving materials, is greater than it has ever been in the past and the present indications are that the demand will materially increase each year as its efficacy is proven, until the cry of the present day for "hard roads" will develop the paving material business into mammoth proportions, and if the test of time will show that paving brick is the most desirable material to be used, we shall find ourselves with properly equipped appliances for the manufacture of this article of commerce,

and will, therefore, need the protection referred to above.

To produce this material requires a large expenditure of skill and capital and is attended with a great many risks to be guarded against by those who engage in its manufacture, but these we shall also pass and come direct to the one great danger that threatens our ultimate success.

As our laws now stand, we are amply protected from material loss on material that is furnished to enter into the construction of buildings, but we need further protection in paving brick material, which can only be secured by obtaining the assistance of our legislators. We are aware that they are continually besought from various sources for their assistance in first one direction and then another, to protect this and that industry, and this and that enterprise from various pitfalls into which the respective schemes might become directed until it becomes difficult for them to choose those demands which are meritorious.

We are confident, however, that our case is one deserving their attention and that if properly laid before them they will give it the attention it deserves, and thereby offer to us security from the rascally contractor who is becoming quite too numerous. When counties, townships or cities conclude to make public improvements, they advertise for prices for the construction of the proposed improvements, generally awarding the contract to the lowest bidder who is able to furnish bond for the completion of the contract. The public through its official, is not required to know that the materials entering into the construction of the improvements are paid for by the contractor, but are only required to know that the work is completed in workmanlike manner which, if satisfactory, ends the deal except to turn over

to the contractor his contract price agreed upon for the performance of the work. Should the contractor be a rascal, which is too frequently the case, the party who furnishes him the material may find after a hard season's work and the expenditure of a great amount of money that there is nothing in it for him, and his only alternative is to nurse his wounded purse and await another opportunity.

Several methods could be adopted which would be honorable and just that would prevent such loss to the innocent party who has been thus defrauded of his honest dollars. We shall not presume to offer to this Convention any particular remedy for this evil, as we believe that a discussion of the subject will develop a remedy that would be much better than any we could suggest. We should, however take some action by agreeing on some plan of protection, appointing a committee from our members to present the demand to the Legislature now in session and each individual member should make it his especial duty to immediately call upon or communicate with the legislators from his district and urge upon them the necessity for prompt and immediate action.

The discussion favored the use of brick for paving streets and in the future public highways.

C. C. Gilman, of Eldorado, Ia., read a paper, subject, "Terra Cotta Lumber."

The discussion of the paper closed the programme for the day.

Adjourned.

WEDNESDAY FORENOON.

T. D. Spaulding presiding.

F. T. Stare, Sibley, Ill., read a paper, subject, "Road and Street Construction," in which he recommended the use of iron roadways—using a flat, wide rail, with flanges to confine the wheels of vehicles to the track.

The discussion following the reading of this paper took a wide range. A few advocated the use of gravel on highways. All agreed that the first and important factor is a dry roadbed and to secure this the highways should be thoroughly underdrained.

THE USE OF BRICK FOR PAVING STREETS AND HIGHWAYS.

It was generally agreed that in the near future we shall pave our streets and roads with brick. The various methods of laying the brick were fully discussed.

J. McCabe expressed the opinion that in almost every township in the State clay may be found that will make good paving brick.

Mr. Loy concurred in the opinion of Mr. McCabe.

The vitrification of brick was discussed with much interest. It was agreed in the course of the discussion that a vitrified brick is brought to a heat sufficient to unite the clay solidly in a glassy state—non-porous. It was further agreed that only vitrified brick should be used for paving.

"Brick Burning," by G. C. Stoll, of Lexington, Ill.

Mr. Stoll delivered an able address, extemporaneously, upon the subject. The speaker took up the various methods of burning, with the familiarity of an expert in the business. The discussion following embraced the use of oil largely—the cost per thousand brick ranging from 35 cents to \$1.

Mr. Loy, of Monticello, Ill., gave his experience in the use of oil which was not very favorable.

Mr. Pike suggested that it is not practical to change our plants and then have the oil company advance the price.

AFTERNOON SESSION.

The Secretary read a paper written by *The Brickmaker*, subject, "The Fuel of the Future."

J. D. Shea, of Decatur, addressed the convention upon the drying of brick and tile. The speaker urged the necessity of ventilation—a circulation of air through the brick and tile if the clay does not crack. He has lately constructed a furnace dryer (Sharer) with a capacity of 75,000 brick and takes three days to dry—the clay being so tender as to require slow drying. The capacity of the dryer will enable him to take out 25,000 brick per day. He uses slack coal and being convenient to a coal field enables him to dry brick at a cost of 25 cents per thousand. The use of the dryer enables them to run the works all the year with a certainty, which will admit of the regular employment of his help, without loss of time.

DISCUSSION.

Mr. Pike hacked his brick "chimney hack," on slatted floor.

Mr. Lawrence uses exhaust fan and draws the heat from burning kiln to drying room to dry his tile. With a hot kiln he can dry his tile in 24 hours.

It was quite generally agreed that the dry hot air system of drying is the most rapid method, but is not with many clays advisable on account of the tendency to crack.

D. O. Loy, of Monticello, read a poem, which was very happily received. [Will be published in the next issue of the JOURNAL].

The Treasurer reported a balance in cash on hand for 1890 of \$49.

The officers elect were, C. F. Tenney, Bement, president; Wm. Hammer-schmidt, Lombard, Ill., vice president; G. C. Stoll, Lexington, secretary; J. McCabe, Rushville, treasurer.

Adjourned to meet the third Tuesday in January, 1892.

This was one of the most interesting conventions that has been held for several years past.

THE INDIANA TILE AND DRAINAGE ASSOCIATION.

The Association held a short session on the evening of the 21st of January, in the rooms of the Board of Trade in this city, President G. S. Pollock presiding. Henry Kneal, S. C. Cowgill and J. A. Daily were appointed a committee to secure the enactment of a law to make drain tile used to underdrain land a lien upon the land unless paid for by purchaser. After a brief discussion of the subject of burning kilns, the following officers were elected for the ensuing year: President, J. J. W. Billingsley, Indianapolis, Ind.; Vice-President, H. A. Eudaly, Sheridan, Ind.; Secretary, J. A. Daily, Riley, Ind.; Treasurer, M. J. Lee, Crawfordsville, Ind. Adjourned to meet second Tuesday in December, 1891, in this city.

HAS A BETTER TRADE.

Editor Drainage Journal:

The farmers in this section have not stopped drawing tile yet; They begin to see the profits that may be derived from draining and are going at it with a vim. Much the heaviest corn this year has been grown on tile drained land, and on some lands that have grown but little before. We put in a new tile machine last spring which has helped me very much this season, enabling me to make a number one tile. We get a good burn every time. Business is on the move here.

JOHN GIBSON.

Monticello, Ia.

RECLAIMING AND DRAINING.

Editor Drainage Journal:

We are just completing a drainage project of reclaiming about 3,000 acres of the best land in the world. The main ditch is 3.7 miles in length and about five feet deep so that the Lake Labish Swamp is *non est* and vegetables and hay

will take the place of tules and willows. The railroad wreck at Lake Labish was in part on my land. I have about 20 acres in this swamp and will put in 10,000 tile into it the coming season. The tile cranks are on the increase here, some by conversion and some by immigration. I finished tiling my 10 acres of prune orchard last spring, and am well satisfied with the result. Will send you plat of it if you desire it. [Send it.—ED.] I put 6,5000 feet of tile into the orchard.

FRANK J. BEATTY.

Chemawa, Ore.

D. A. Coggsball, Croton, N. Y., writes: "Do you know of any parties who have a good quality of drain tile for sale within easy reach of me by rail. I should want them delivered at Locke." He further asks: "What is the reason tile manufacturers do not advertize their tile for sale in the JOURNAL? [Answer—We do not know. We have offered to enter their addresses in a directory page of the JOURNAL for \$1.00 a year, but they fear to see their names in print, perhaps.—ED.]

We are in receipt of a callendar published by J. W. Everal, Westerville, O. It is intended for the use of his trade and at the same time advertize the product of his factory—Drain Tile and Hollow Building Blocks. It is a handsome, appropriately illustrated callendar. We are glad to see this evidence of business enterprise and hope that others may go and do likewise.

Hon. G. S. Oldfield, of Norfolk, Va. was in attendance at the late Convention. We are always glad to greet this sterling man. He has been a pioneer in the introduction of the use of drain tile in his section of the State. Mr. Oldfield says that the demand for tile with him is equal to the supply, and that the interest in drainage is increasing.

THE TOUCHES OF THE NEIGHBORS.

BY THE AUTHOR OF "JOE BYERS' STORY."

CHAPTER XII.

"The melancholy days have come, the saddest of the year,
Of wailing winds, and naked woods and meadows brown and sere,
Heaped in the hollows of the grove the autumn leaves lie dead,
They rustle to the eddying gust and rabbit's tread.
The robin and the wren are flown and from the jay
And from the wood-top calls the crow, through all the gloomy day."

The autumn leaves were falling fast when we closed our last chapter. The Flower Band has gathered at the home of Mr. Jacob Story. Mrs. Story had not only given her consent but had said to her daughters:

"I shall be glad to have them meet here; but you girls must do the fixin'."

Mary and Esther were delighted with the responsibility imposed upon them, and with busy hands had put everything in order for the coming of the members of the Band.

The warm welcome extended to each member as they arrived was right royal indeed. There has been quite a change in the Story family in the past two months—a new world has opened up to the girls, and the parents have new inspirations as to the future of their family. The past two months have been delightful to the family entire. Never in their experience have they enjoyed so fully the society of their children.

Mary and Esther have followed the advice of Mrs. Furman. They have availed themselves of every opportunity to lighten the labors of their mother; to speak appreciatingly of her toils; to smooth her locks of gray hairs; to kiss her care-worn cheeks, and in every way make themselves kindly in word and deed. The change was so remarkable that Mrs. Story took notice of it and

returned in a measure the same warmth of affection. When the girls were ready to go to the last meeting of the Flower Band, Mrs. Story remarked: "Girls you can hold the next meeting here if you want to." "Thank you, Mother, thank you," burst forth from the lips of each of her daughters, and they imprinted another kiss each and added other kind words as they took their departure.

When on their way, Mary said to Esther:

"I would not have believed what a change could be made with warm greetings and kind words in a family if I had not experienced the change myself."

"That is so, sister, it is simply wonderful; and then to think that we have lived for years in a churlish way, not enjoying life ourselves or helping those about us to enjoy themselves," said Esther.

"I shall always thank Mrs. Furman for her kindly advice. I am sure I never would have thought of it myself," said Mary.

Uncle Jacob Story was conveniently near to make some remark to the comers and John was ready to care for those who came horseback or by some conveyance and make himself generally agreeable.

"Quite a change has come over our neighborhood in the past year, don't you think?" said John to Miss Gracie Dorseheimer.

"Yes, indeed, Mr. Story," Gracie replied.

"Mrs. Furman is a great woman, don't you think?" said he.

"Well may we think so."

Turning himself about, John saw Mrs. Furman coming, and remarked:

"There she comes now."

From the house and yard the girls came running to greet Mrs. Furman,

who, like a good queen, gave an approving nod, a kind word, a kiss, and a pleasant recognition to all. Reaching the house she found her way to Mother Story and greeted her warmly, entering freely into a conversation about household affairs apparently oblivious, for a few moments, to the presence of others, speaking approvingly of this and that little decoration. Passing to a card board upon which had been arranged colored forest leaves, she remarked:

"How beautiful, and yet they make me sad. They remind me that by and by the autumn of life will come with me, as with others—'brown and sere'."

"Yes; soon come. It seems to me only a few months since I was a romping girl," said Mrs. Story.

"So it will be, Mother Story, with us all. Let us act well our part in life, and trust that our last days may be pleasant days," said Mrs. Furman.

Turning to the members of the Band, Mrs. Furman remarked: "It is about time for us to meet, girls," and then, addressing Mrs. Story, she said: "We shall be glad to have you with us in our meeting."

"Yes; come in, Mother," responded both Mary and Esther.

"Yes, do come in, Mrs. Story. I want to talk about strawberry growing, and you may help me."

"I'll not be any help, but I will go in and listen to you."

The usual opening exercises were had then Mrs. Furman began her talk on strawberry culture, by remarking:

"It is not in the country like it is in the city. In the country, girls have much outdoor exercise; there are many things to call us forth into the fresh air. In the city, if a person goes out, there is not the freedom or freshness in the surroundings and you feel that the eyes of

many are upon you, so that you are restrained in your movements. But it is true of the country, that we are likely to devote ourselves so closely to our daily duties as to neglect needful recreations of body and mind. When we have been applying ourselves close for a time to our household chores, it does us good to run out into the garden and work there a while—the fresh air, the sunshine, the opening flowers and growing plants inspire us with new life. The change is good for body and mind.

"Now, if with this needed change we may do something that will repay us in health and money, will it not be well, girls?"

"Yes! Yes!" they responded.

"My strawberry talk is along this line. If we learn how to grow strawberries, so far it will be a valuable education; it will widen our knowledge of practical things, and add to health of body and mind. It is a little out of season to talk of strawberries and cream, great luscious berries melting on our tongues, is not far in the distant future if we get ready in time.

"To begin, I can tell you how we did at our house and we succeeded in growing very nice berries, but nothing will take the place of experience. But I do hope that each of you will get your father to set apart a few rods, break the ground and make it fine and ready for your use. As a rule we either raise such things or go without them."

"That is so," said Mother Story.

"Yes; the ground should be put in good condition. The next thing is the selection of plants—well rooted young plants. There are perfect flowering plants and imperfect; the perfect fertilize themselves and the imperfect have to be fertilized by the perfect plants. The better beginning, perhaps, is to send to some reliable grower and tell him

what kind of soil you have and how much land you wish to set to strawberries and request him to send you such kinds as will likely succeed best. It will cost something, but they will give instructions as to planting. I think it probable that we can furnish each of you with a dozen or more plants from our plants next spring; but, whatever I let you have will be without charge, ["Thank you. Thank you," came from the lips of several present,] and I will give you instructions then about setting them, so I will not say more at present as to the method of planting but take that part up at a meeting in the season of planting.

"I must talk a little about what you can probably do, that is, grow ten dollars worth of berries on four rods. If well fertilized and cultivated it may be that you can grow more. Suppose you ask your fathers to set apart eight or ten rods and prepare for you next spring, then, you set the plants and do the rest, except an occasional cultivation with a horse. The first year do not let them fruit, so you must wait a year for best results. Do not weary. Besides, let us send and get Gregory's, Henderson's, Vick's or Sibley's catalogue of seeds and make some selection of rare flowers for next spring."

This talk, given in brief, was full of interest to the members. The idea of earning their own money, or a part of it, was an attractive feature to all of them. For is it true that many girls, though daughters of well-to-do farmers hardly have in their own possession at one time so much as five dollars, from childhood until they are married or become of age, and what they do get is grudgingly doled out to them with injunctions about economy and all that, until they are ready to shrink into some corner and be out of sight and out of mind.

Mrs. Furman's purpose in opening the way for the members of the Band to earn money for themselves met with a very hearty approval.

After selecting the music and song for the next meeting of the Farmers' Club, and a run about the yard, garden and poultry grounds, the Flower Band adjourned—the members lingering about the Story home until the setting sun neared the western horizon before the last leave-taking of departing members was over.

The Farmers' Club assembled at the appointed time, the attendance, if anything, had increased. The Flower Band aided by quite a goodly number of the young men sang a few selections before the hour of regular business.

The president, Mr. Moon, in the opening of the order of exercise announced the names of several prominent farmers from distant neighborhoods.

The crop reports were short, embracing largely the yield of corn and late vegetables, a discussion arising as to the best methods of caring for winter vegetables, after which Mrs. Furman read a paper, subject, "Our Country Social Life." The writer said:

"There is probably much more in the subject assigned me for consideration than may be thought. There is, among those engaged in agriculture a longing for something better in some way. Parents are discontented, their sons and daughters are discontented. They feel like Ishmael, that every man's hand is against them. This brooding of discontent has a cause. People in the country have better air, purer, fresher food and more regular hours than people of the city. Statistics show, however, that a larger per cent. of female inmates in our insane hospitals are from the country than the city. The morphine and alcoholic habits that send most of those that

go from the city is hardly known in the country. Then what is the cause of the discontent and insanity? We answer that it is want of a better social life. It is the isolation, loneliness, the brooding over sickness or little misfortunes, the want of contact with others—mind sharpeneth mind as steel sharpeneth steel. It is the daily round of doing the same thing over and over a thousand times and yet never done; the grinding drudgery mill that grinds on, grinds ever, until the last living grain passes through. The men folks do, occasionally, meet and exchange thought or news; they go to the post-office, the village store and public meetings, but they bring with them into all they do, more or less, this brooding of discontent—they see the evil but never the good. So they are called chronic grumblers. The remedy for this evil of discontent, as before indicated, is a better social life, social gatherings of old and young, cheerful conversation, music, games, anything in the way of innocent amusement to rest and invigorate body and mind. Reading circles would be good—yes, reading circles in the country once a week. Why not? A circle with music—the girls could hear new music and enjoy the society of each other. And the mothers, don't be alarmed at this innovation. Again I repeat, the mothers could mingle socially together, exchange experiences about many little things. The fathers and sons could throw off their everyday clothes and put on their Sunday best, if you please, and meet their neighbors, but who would do the work? Some one says, "we reply that after the meeting is over, they will go back to their daily toil refreshed in body and mind." Besides, such contact as is had in the meetings of this club will lead to the better way of doing things, better success, with less hard la-

bor both in the house and out of doors. One of the deplorable things growing out of this want of social life in the country is the absence of parents from most of the social amusements of their children. The sons and daughters will manage in some way to meet each other; their amusements may not be of the most elevating character. It is far better to make a place at home and join with them occasionally in amusements than to have them slip off to the barn, or to some secluded spot, to indulge in games that you would not approve. Take the family and go a fishing, let the bogs go hunting. Take an hour or two at the close of some day's labor and play a game of croquette or some other healthful game. "Oh, I'm too tired," says one. It will rest you, invigorate you, body and mind. Make the pathway of your own lives and of your children ways of pleasantness. This Flower Band that surrounds the writer, this meeting of farmers and their wives, sons and daughters, are steps in the right direction. But let us widen these influences, take the fruit of this pleasant contact back into the family circles to our neighborhood. The writer knows full well that the meetings of this little Flower Band has been a blessing to her and to them, and, more, they have blessed their homes. There are many little things refining and invigorating that have had a reflex influence on home life. And so it will be. The writer insists that meetings for social recreation should be multiplied in the country. They will add to the content, enjoyment, health of mind and body. Such social contact will develop many bright, strong minds, that otherwise will remain buried in darkest night. Some of your own children may make intellectual giants if they can have the opportunity to develop the metal that is in them. The poet says:

'What 'er can brighten to our gaze
The trembling dawn of childhood's days;
What 'er can feed more clear and high
The flame of youth's expectant eye:
What 'er can make more richly good
The blood of man or womanhood,
Or bid old age look smiling round
At gems of earth-joy newly found;
What 'er can say, 'While strength endures,
My life has love and strength for yours.' "

At the conclusion of the reading of Mrs. Furman's paper a free discussion of the subject was had. Never before, perhaps, had many of those present such an insight into the unsightliness of their daily lives. Many resolves to amend were made by parents who were present.

Following the discussion came the reading of a paper, subject, "The Farmer's Fruit Garden," by Alexander Barton. The writer said:

"If I were to make my paper as short as many farm gardens are short of products, it would be short indeed. The usual experience in the line of the farm garden is to lay off a few rods square of land and put a paling fence around it high enough to keep the chickens out, then plant gooseberry bushes, currants, raspberries, blackberries, and a flowering shrub or two around next to the paling. In a few years this array of vines and bushes take up about eight feet around the garden through which the weeds grow over-topping all. In the spring a load of barnyard manure is spread over the garden and then the soil is turned and harrowed and some of the planting done. Later on we are busy and must, or think we must, leave the care and cultivation to the women folks, and if it comes out well, well and good, and if not, it is not our fault. The women are busy but they do what they can. The result is, that we get a few berries and vegetables somewhat dwarfed for want of cultivation. The want of care and results outlined embraced very fully the writer's experience of some years ago, and of some farmers now, but I am

pleased to have it to say that the writer does differently now. A few years since, he had the pleasure of reading a book in which there was a description of a garden which was an oblong square, or eight rods long and four rods wide, with eight feet grass plot at each end to turn the horse on in cultivating the garden. I remembered how often I had had trouble with my team trying to plow and cultivate the little square garden. At once I determined to have a garden worthy the name. I said nothing to my wife about it until I had laid out the section of ground and put two lines of underdrains through the length of the intended garden and began to enclose the plot, when she asked me what I intended to do. I told her that I was going to have a garden. She remonstrated with me, saying, that the one we had was weedy enough. I explained, and enclosed the garden and planted in rows running from end to end, so that we could cultivate with the plow, fruits and all. Now we find no difficulty in cultivating, and it is a pleasure to work the garden with the many improved tools that may be obtained so cheaply. Now we grow few weeds and an abundance of everything in the way of small fruits and and vegetables."

The discussion following the reading of the paper was participated in by some of the ladies present, and the suggestions of the paper highly approved.

A song by the Flower Band ended the exercises, the meeting adjourning. The usual season of social greeting followed. Those from distant neighborhoods were delighted with what they had heard and seen, and returned home to tell how successful the farmers were making the meetings of the Club.

* * *

Three and one half years have gone by since the brief account of the last meetings of the Band and Farmers' Club were

made a matter of record. Let us briefly note the changes that have been wrought in "the touches of the neighbors" in this time.

Mr. and Mrs. Furman have prospered in the management of the farm. The change wrought in the "Old Miller Place" is talked of far and wide. The farm has been underdrained, manured and clovered until the yield of farm products astonishes many of the neighbors. The crop of small fruits has become a source of considerable revenue besides furnishing their table with fresh or canned fruits the year round. The family of two has grown to three—a little flaxen-headed, blue-eyed boy has a place in a little armed chair at the table—a center of attraction. The house and grounds have been beautified more and more each year until it is indeed an earthly Eden.

The Flower Band still lives, though some of the members have married and removed to other neighborhoods, yet others have taken their places. The work done in the way of educating the taste for the true and the beautiful cannot be measured. There will be many yet to rise up and praise the blessed work that has been done and that which is in process of doing.

The Farmers' Club is an established institution. The work has widened until it is an educating force in many directions. The social status of the neighborhood, or neighborhoods as for that, has greatly changed for the better—in the advance of farming interests, general intelligence, socially and otherwise. Social gatherings at the farm houses are common, for there has been a growth of social life among old and young. The brooding spirit of discontent has fled away. So much has been said about grumbling that few are to be found who do not speak pleasantly of

the past and hopefully of the future. The good people have found that with head work as well as hand work they may set apart hours for social recreation and not get behind in their business.

The Story family has had its changes. John married Gracie Dorsheimer. Mary married Mr. Alexander Barton's son, Edward. Esther Story is the secretary of the Farmers' Club. Father and Mother Story find time to go to the meetings of the Club and the social gatherings of the neighborhood, and have apparently taken a new hold upon life. The change in other families might be mentioned as evidence of the upward and better growth of the neighborhood, in the few short years since Mr. and Mrs. Furman came to the "Miller Farm."

Two moving master spirits have dominated for good in the Story neighborhood, and the fruitage has been pleasant to behold an exhilarating to the taste. So it is and so it will be when the trend is "up the line." Our story in brief illustrates what two noble hearts, possessed of the right metal, can do in their "touches with the neighbors."

[CONCLUDED].

HIS WAY OF ADVERTISING.

"I beg pardon for intruding upon your time," said the polite, smiling man with the valise in his hand. "A peddler is a nuisance. I know it as well as anybody. But there are various kinds of peddlers and all of must live. It isn't our fault we are here. Those of us that earn our living honestly have to share the odium that belongs to the calling. I'm not complaining of this, gentlemen. It is a part of the curse that came in the original package to Adam. If there is any of you that has a spot of grease on his coat, vest or pant—trousers," he added opening his valise and taking out a small cake of soap and a sponge "I shall be

happy to remove it without charging a cent and without asking you to buy my soap. It's my way of advertising. My dear sir, allow me. There is a little spot on your vest." He rubbed the spot with the piece of soap, deftly applied the sponge, made a few passes over the cloth with a piece of cotton sheeting and said; "There sir, that spot is gone. You will never see it again, and probably you will never see me either, as I travel but once through a community. My goods will be found at the stores. I take it for granted nobody wishes to buy a cake of my soap. I wish you good morning, gentlemen." After the polite, smiling man had gone away, the gentleman whose garment had been operated upon, had occasion to consult his watch. It wasn't there. It had disappeared with the spot.

EDISON LISTENING TO THE SUN.

It has been observed by astronomers that the appearance of spots on the sun are co-incident with meteorological phenomena, and that cyclones, tornadoes, water spouts and earthquakes are more frequent or are entirely coincident with the solar disturbances. It is also ascertained that these spots are the result of bodies falling into the sun, and that the disturbance affects the telegraph wires on this planet. Mr. Edison considering all these data, has conceived an idea of the most marvelous enterprise. It is the project of making it possible to hear the sounds which the falling bodies make on the sun. In New Jersey there is a hill containing many tons of magnetic ore. This he has encircled with many miles of wire, and he proposes by means of electric currents, to register on this apparatus the disturbance, as the vibrations affect our atmosphere, and by connecting these wires with a gigantic phonograph, to listen to the sounds that occur in the sun's atmosphere.—*Electrical Review*.

The Drainage Journal.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete; you will have use for many things published and the volume complete will make a valuable book

J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.

SUBSCRIPTION RATES.

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten	8 00
Single Copies.....	10

Send for rates for larger clubs.

TO ADVERTISERS.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile. It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers.

It is the best possible medium for those having tile machinery, brick machinery, kilns, fire brick, engines, ditchers, clays, tile yards or second-hand machines for sale, to advertise in.

The rates of advertising are reasonable.

ADVERTISING RATES.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1.
Twelve lines Nonpareil type make one inch.
Liberal discount for longer time and larger space.
Transient advertisements must be paid for in advance.
For large advertisements address the publisher for terms.

DEPRESSIONS IN UNDERDRAINS.

At the late convention of tile and brick makers held at Springfield, the statement was made that "if there are ups and downs in the grade line of a tile drain the pressure of water from above will force the water up over the elevations in the drain, forcing the water up hill."

This statement is true in a limited sense. The line of the underdrain above being higher will cause the water to accumulate until the water line in the soil rises to a point high enough to pass the water over the raise in the line of the

drain, which must, necessarily, for a time, at least, saturate the soil to the height necessary to give the water a free flow. Besides effecting a raise in the water line in the soil, necessary to allow the water to flow off, such raises in the grade line obstruct the free flow of the water, and lessen the capacity of the drain.

The fact that water flows out freely from an outlet does not prove that there are no defects in the line of the drain. The water may reach the outlet by percolating through the soil, in part, to get there. It is not infrequently the case that there are places along the line of the drain where the work of draining the soil is imperfect—where the surface shows a saturated condition of the subsoil, in nine cases out of ten such failures to underdrain the soil arises from imperfections in grade line or in laying the tile.

The water may get to the outlet of imperfect drains and flow away freely, but it gets there at the expense of capacity and efficiency of the drain.

There are many clear-headed, practical men, that can lay tile that give excellent satisfaction for efficiency, especially where the fall is sufficient to insure efficiency. But the fact remains that the best results in drainage systems have been secured where the best engineering skill has been employed.

Underdrainage is a permanent improvement, to last for generations; an improvement that will yield an annual return in the increased products of our crops; hence we can well afford to be at the expense of doing the best work that can reasonably be done. And where the fall is slight and the work somewhat difficult it is better to employ engineering skill at a reasonable expense. In most cases the results will be most satisfactory. By securing a drainage level, a little practice will enable almost any

clear-headed man to lay out drainage systems.

The National Brick Manufacturers' Association closed a very interesting annual gathering the 23d of January, after having been in session for four days. Such papers read before the Convention as we may judge to be of interest to our readers, will be published in the future numbers of the JOURNAL.

OHIO CONVENTION.

The next annual meeting of the Ohio Brick, Tile and Drainage Association will be held at Columbus, Ohio, Feb. 25th and 26th, 1891. It is earnestly desired a full attendance shall be present, as matters of great importance to all workers in clay will be discussed. Our last meeting was productive of much good to all who attended and the undersigned were appointed a committee to arrange a program and to notify every worker in clay whose address could be obtained in order to have a full representation at our meeting this year. Matters of vital importance in drainage, tile, building and paving brick manufactures will attract the craft. The manufacture of paving brick for roadways which are now coming into general use, will form an important part of the discussions. Well known and successful manufacturers from other states will make addresses. Come and bring your neighbor and devote two days to the good of your business. Remember the date, Feb. 25 and 26.

Very Respectfully,

B. W. BLAIR,	} Committee.
J. W. EVERAL,	
R. E. FARNHAM,	

The following is the programme of the annual meeting of the Ohio Tile, Brick and Drainage Association to be held in the A. O. H. Hall, 71½ North High St., Columbus, Ohio:

President's Address—W. A. Eudaly, Cincinnati, O.
Gleanings from Ten Years' Experience Making Drain Tile—M. Horlocker, Columbus.
Brickyard Construction—Geo. S. Tiffany, Tecumseh, Mich.

Notes on Dry Press Brick Manufacture—W. D. Richardson, North Baltimore, O.

Pressed and Ornamental Brick—C. W. Raymond, Dayton, O.

Clays; their Nature and Adaptability to Certain Uses—Prof. J. F. Elsom, New Albany, Ind.

Burning Brick in Chicago with Crude Petroleum—Chas. Purington, Chicago, Ill.

The Black Swamp—D. O. Loy, Monticello, Ill.

Approved Methods of Laying Pavements—H. S. Hallwood, Columbus, O.

Address—D. V. Purington, Chicago, Ill.

Tile and Brickmaking Combined—J. W. Everal, Westerville, O.

Progress of Our Art—B. W. Blair, Cincinnati, O.

Drying and Burning Drain Tile—Elliott, Rittman, O.

Question Box will be opened at the close of each session. Reduced railroad rates have been provided for on the certificate plan. Each delegate must take a receipt or certificate from the station agent stating that a first-class ticket has been purchased which, when countersigned by the Secretary of the Association, will entitle the member to a return ticket at one-third regular fare.

THE IOWA BRICK, TILE AND DRAINAGE ASSOCIATION.

To be Held at Des Moines, Feb. 4 and 5.

The following papers and addresses have been provided for:

Address of Welcome by the Governor.

Annual address by the President, J. V. Boling.

Brick Paving, by the Merrill Brick Co.

Report of City Engineer on Methods of Laying Pavers. Best Methods of Making and Burning Paving Brick.

What has Tile Drainage Done for Iowa, by T. E. Haines.

Story of Tile Making and Drainage, by Editor of DRAINAGE JOURNAL.

Best Methods of Laying Tile, by Robt. Goodwin.

Paper by E. M. Pike.

Drainage of Public Highways, by Wm. Kettel.

OUT OF THE ASHES.

S. C. Cowgill, of Summittville, Ind., had the misfortune to have his tile works burned a few days since (the largest works in the State), will have new works in operation by February 5th. He employed as many as 50 men to erect his new works, which is characteristic of his push. Mr. Cowgill had contracts for large tile when his works were burned sufficient to keep them running day and night for two months. He again puts in the New Departure Tile Mill same as before, the machinery throughout being entirely new. Mr. Cowgill's energy furnishes employment for his men without a skip, notwithstanding his misfortune.

THE WORK OF A STEAM SHOVEL.

Mr. L. T. Harding, of LaPorte, Ind., quite recently purchased a steam shovel from the Marion Steam Shovel Co., Marion, Ohio, and has cut a channel from the lake near the City of LaPorte into Stone Lake and from Stone Lake into Pine Lake. After this, steamers will run direct from the Baptist Assembly grounds on the west side of Pine Lake to the City of LaPorte.

Mr. Harding is greatly pleased with the working of the Steam Shovel. He says that with the use of it much good land can be reclaimed and their lakes cleaned out and beautified.

The Marion Steam Shovel is an invaluable invention. There are many of them in use and they are doing good service in cutting waterways to reclaim large bodies of otherwise worthless lands, making them the best for agricultural purposes.

There are thousands of acres of unhealthy, unsightly, and in their present condition worthless, lands that by the use of the Steam Shovel and under-drainage will be made the most valuable for agricultural purposes.

WHOLESALE DELIVERY.

About the largest delivery of tile that we have heard of, short of a railroad train, is accomplished by W. S. Keller, Walker, Ill. He uses a traction engine and couples on as many as 15 road wagons; loads them with tile and draws them over the common highways, making a wholesale delivery. How he turns square corners is not so much of a mystery we are told when the ingenious device (his own invention) for coupling the wagons together is understood, and it has to be seen to be understood.

The large posters of J. W. Penfield & Son, Willoughby, Ohio, illustrating a full line of their clayworking machinery have been received. Nothing like them. Those of our readers who wish, can address the firm as above and receive them by mail.

THE WESTERN SPORTSMAN.

The Christmas edition of the *Western Sportsman*, published in this city, was quite worth the subscription price (\$2) for one year. Twenty-three of the leading horses are handsomely illustrated. Indeed, we have rarely, if ever, received such a fund of information about horses in a single number. It is a credit to the publishers and the country.

SISTER ROSE GERTRUDE'S WORK.

Sister Rose Gertrude, the young woman about whose work among the lepers of Molokai so much has been written, has been induced to reply to the charges made against her for renouncing her work. Her article, the first from her pen, is to be published in *The Ladies Home Journal* for February, and will contain a full explanation of what she has accomplished among the lepers, and why she was obliged to forsake her work.

BROKEN RECORD.

The New Departure Tile Mill, manufactured by the Anderson Foundry and Machine Works, Anderson, Ind., has been improved until it turns out tile as large as 30 inches. The Washington Pottery Co., Spokane Falls, Wash., have ordered one having dies to turn out 21, 24 and 27-inch tile. The Anderson Foundry and Machine Works report the business outlook this season as unusually flattering. This firm also manufacture the Chief Brick Machine and its excellence is quite well attested by the large number in use in all parts of the United States and Canada.

A TEST WANTED.

Being willing, yea anxious, to test our kiln and compare results with the best, we make the following offer: The owner or owners of one tile factory in each of the following states—Ohio, Indiana, Illinois and Iowa—who own and operate one of the improved modern kilns, and will erect one of our kilns of equal dimensions and burn therein an equal quantity of tile; said tile to be of the same clay, receive the same care in handling, drying and burning, have the same nesting, etc., etc., as nearly as practical, furnish a true statement of the results to be read at the regular meetings of all clayworking fraternities in the state in which the test is made, give us ten per cent. of all net gains over the competing kiln, give us a satisfactory guarantee that the above conditions will be faithfully fulfilled, we will give a yard right to such for our kilns. The conditions of above to be in force five years (except the *yard right* which shall be unlimited) and a settlement made semi-annually.

We consider this a fair offer, for, if it does not make the purchaser money it costs nothing. If it makes us one dollar it makes him nine. We reserve the privilege of selecting from applicants. Correspondence solicited. State the kind of kiln in use.

STEWART BROTHERS.

Mt. Victory, Ohio.

TESTIMONIALS:

ST. JOHNS, O., June 30, 1890.

MR. J. B. GRAWCOCK: The Tile Oven you built for us this spring of your patent, is giving entire satisfaction in every respect, we have burned 3 burns up to this date and it beats anything we have ever seen. We have been using the — Kiln which gave us good satisfaction, but yours discounts it 50 per cent. in saving of time, fuel, labor and loss. We burn in your kiln in 60 hours, that is, watersmoking and all included, it burns the tile a nice cherry red from top to bottom. It is very easy fired. Easy to manage. We burn with six cords of hard wood, and we are very sure that it will be very durable, as we cannot notice the least crack in ours from the 3 burns. We can heartily recommend it to any one wishing to erect a tile oven.

Yours very respectfully,

T. EMERSON & SON.

Every week the *Scientific American* presents whatever is new in the world of science, art and manufactures, thus doing service both to theoretical and practical workers. For forty-five years Munn & Co., 361 Broadway, N. Y., have conducted this paper with close reference to the work of procuring and describing patents in a way to make it an authority on scientific and mechanical subjects.

"Big 4" Route.

MARDI GREAT EXCURSIONS

TO

New Orleans, La., and Mobile. Ala.

The "Big 4" Company will sell excursion tickets from principal stations to the above named points Feb. 3rd to 8th inclusive, good to return until Feb. 28th; rates from Indianapolis to either of these points will be \$22.50.

For tickets and full information call at "Big 4" Offices, No. 1 East Washington St., No. 138 South Illinois St., Massachusetts Avenue and the Union Station, Indianapolis.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.
GEO. L. PEARCE, Guineys, Va.

FOR SALE.

Centennial Tiffany Tile and Brick Machine, dies from 3 to 10 inches. Side-cut brick die and tables. Address ANDREW WILTZ, Metamora, Ill.

FOR SALE.

One Junior Westinghouse Engine, 15 h. p. Has been used for six weeks running a fan. For particulars and price, address J. W. PENFIELD & SON, Willoughby, Ohio.

FOR SALE OR TRADE.

Saw Mill and Tile Factory, situated in Allen Co., Ohio. 30 h.p. boiler, Ohio Tile Mill. Business good, but present owner has too much other business. For details, address RUPRIGHT BROS., Van Wert, Ohio.

FOR SALE.

One Terre Haute Tile Machine, new.
One Penfield Plunge, steampower.
One Eureka Mill.
These machines can be bought very low. Address J. M. HEDGES, Terre Haute, Ind.

WANTED SITUATION.

I have had seventeen years' experience in making and burning tile. Worked 12 years for one man. Can give the best of reference. Anyone wishing an experienced man call on or address

FRANK MATSON,
New Augusta, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN,
Portland, Indiana.

FOR SALE.

1 Ohio Brick and Tile Machine B Size; tile dies $2\frac{1}{2}$ to 12 in. 1 Leach Table. 1 Revolving Table; has been used a part of one season and is in No. 1 condition and a bargain. Also 1 No. 6 Penfield Brick and Tile Machine, brickdie and table; tile dies $2\frac{1}{2}$ to 8 in. and table is in good shape. Reason for selling—want to get a larger machine.

E BIGLOW,
West View, Ohio.

WANTED SITUATION.

As foreman of brick or tile works, paving brick preferred. Have had experience and can give good reference. Address THOS. H. TRAINOR, 2900 N. Adams St., Peoria, Ill.

FOR SALE.

Tile Factory consisting of eleven acres of good land with excellent clay. One kiln; dry shed 220 ft. by 16 ft. One 18 h.p. engine. One Ohio Tile Machine, dies to 8 inches complete and in good running order. Also a good Wallace Clay Crusher and Elevator which have been used but one season, good as new. The Crusher and Elevator will be sold separately if desired and at a bargain for cash. This is a desirable plant. For prices and terms of payment, address JESSE THOMPSON, Selma, Ohio.

A CHEAP EDITION OF PRACTICAL FARM DRAINAGE By C. G. Elliott.

We have just from the press a cheap edition of this work (paper bound) which we offer at the following prices:

Single copy, by mail	\$.25
$\frac{1}{2}$ doz. copies " "	1.40
1 " " " "	2.75
1 " " " express	2.50

There is probably no investment that can be made in the purchase of drainage literature that will be more helpful to those engaged in the underdrainage of their land than 25 cents (or less by the quantity) expended for this treatise on farm drainage to be given to the leading customers of the tile works and those who ought to be underdraining. To do so is to build up the tile trade. We offer this valuable work almost at cost to give it the widest circulation possible. "But," even then, we cannot get some people to do what they ought to do in their own interest. If some good soul gave them to the value of twenty-five cents, they would remember the gift as long as they lived. "But" they fail to apply the same measure to others.

Buy one or a dozen copies of this work and present a copy to those who are

likely to appreciate the gift and await the result. Try it. Address

DRAINAGE JOURNAL,
Indianapolis, Ind.

RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental Designs, Paving Tile, etc.

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Tempering Wheels, Trucks, Moulds, Barrows, etc.

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CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

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Besides making Vitrified Stone Sewer Pipe we Manufacture and keep in stock a full line of

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Every FARMER Boy

Will hail with delight my new Wonder Melon, *City of Mexico*, and will be glad to send 15c. for a package from which to grow 200 great, glorious, early melons.

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How would 134 bu. of Oats (my Bonanza Oats took the American Agriculturist prize of \$500 in gold for the biggest yield, cropping 134 bu. per acre), 40 bu. Wheat, 60 bu. Barley, 100 bu. Corn, and 300 to 500 bu. Potatoes suit you at present high prices. **SALZER'S Northern-Grown Seeds produce them every time.**

60,000 Bushels Seed Potatoes Cheap.

35 Packages Earliest Vegetables, sufficient for a family, postpaid, \$1.00. My new Catalogue is elegantly illustrated, and contains several brilliant colored plates painted from nature, which, when framed, would make fine parlor ornaments. Send 5c. for same, or we will send Catalogue and grain samples upon receipt of 8c., or Catalogue and package of *City of Mexico Melon* for 15 cts.

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STANDARD SLEEP-
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**Heated with Steam and Lighted
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**The FINEST TRAINS IN AMERICA or
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Its SUPERB TRACK and UNRIVALED MACHINERY
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PERFECT SAFETY.

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Its entrance into CHICAGO surpasses all others,
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others in the vast territory it traverses between the
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If you are thinking of building a house you ought to hny the new
book, Fälliser's American Architecture, or every man a
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"There is not a Builder or any one Intending to Build or otherwise
Interested that can afford to be without it. It is a practical work and
everybody buys it. The best, cheapest and most popular work ever
Issued on Building. Nearly four hundred drawings. A \$5 book in
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This book contains 104 pages 11 x 14 inches in size, and consists of
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work, and instructions How to Build 70 Cottages, Villas,
Double Houses, Brick Block Houses, suitable for city suburbs, town
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sections of the country, and costing from \$300 to \$6,500; also Barns,
Stables, School House, Town Hall, Churches, and other public
buildings, together with specifications, form of contract, and a large
amount of information on the erection of buildings, selection of site,
employment of Architects. It is worth \$5.00 to any one, but I will
send it in paper cover by mail postpaid on receipt of \$1.00; bound in
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ington, D. C. No attorney's fee
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Lv Indianapolis	8.30 am.	11.00 pm. (daily.)
Ar Decatur	2.45 pm.	3.50 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.10 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin, Bluffs and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

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No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.

Arrive in Chicago 2.30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily.....11:10 a. m.

Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.

Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday11:55 p. m.

Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily 9:55 a. m.

Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.

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Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

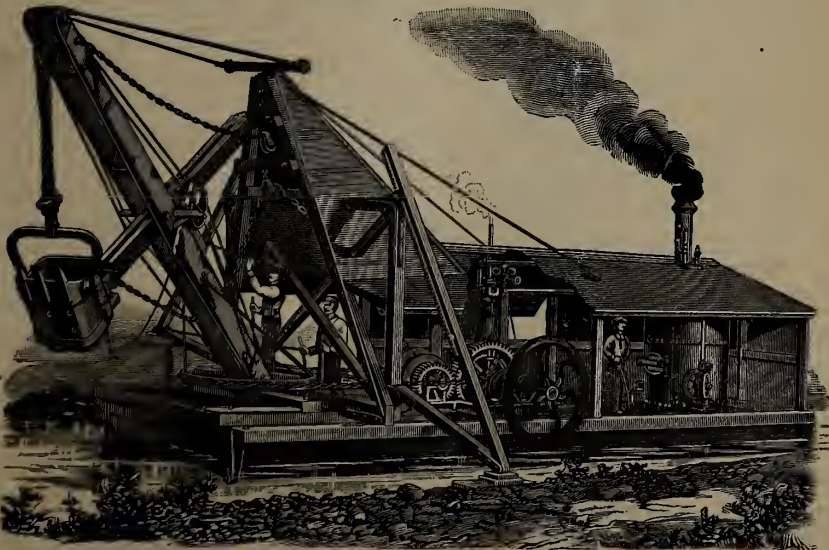
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The Dredge Ditcher.

For Constructing Large, Open Ditches.



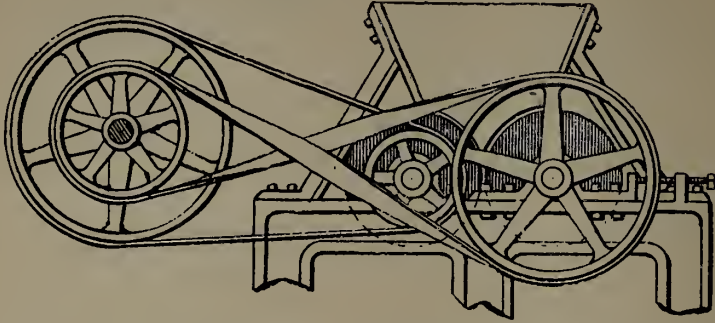
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MARION STEAM SHOVEL CO.,

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THE Crusher and Disintegrator.

PATENT APPLIED FOR.



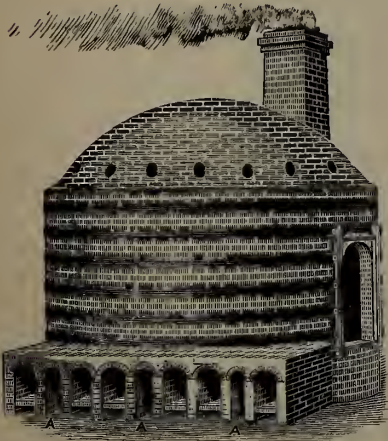
The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

W. H. WICKERS, Agent,

311 English Avenue.

INDIANAPOLIS, IND.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others, in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

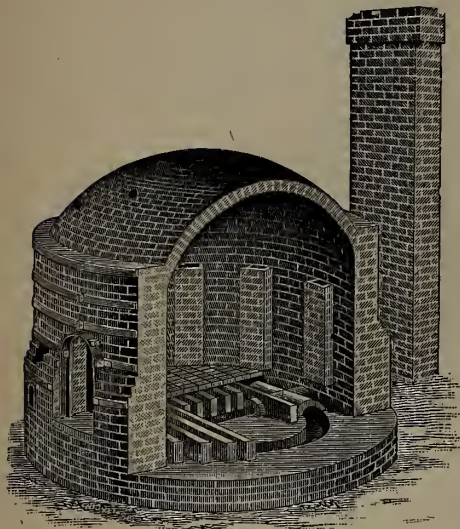
BOX 246, AYLMEER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.



"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT LEADS THE WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal, and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

÷ New and Improved Brick and Tile Kiln ÷

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tile makers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

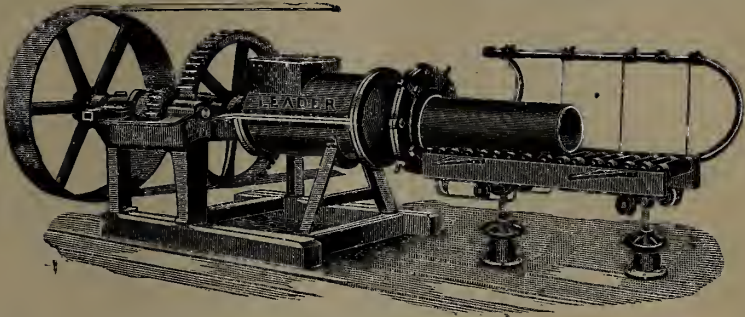
This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



J. B. GRAWCOCK, Churubusco, Ind.

Brown & Frazier Manufacturing Co.,
PORTLAND, INDIANA,
—MANUFACTURERS OF—
Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,
Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR
CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



ELEVATORS
FOR TILE,
BRICK,
PACKAGES, ETC.

Roller & Detachable
CHAIN BELTING,
Designed for
Elevators,

Conveyors,
Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

ADDRESS

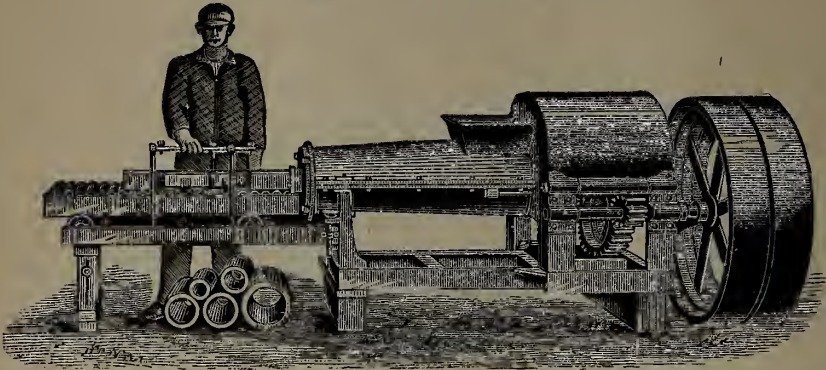
The Jeffrey Manufacturing Co.,

112 East First Avenue,
COLUMBUS, - - OHIO.



KELLS & SON'S IMPROVED Brick and Tile Machines!

"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the tank for both brick and tile. Bricks are taken direct from the machine to the backs and need no re-pressing for the finest fronts. It has but one set of gears and makes all kinds of brick and different sizes of tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-two Years' Experience in the Manufacture of Brick and Tile Machines.

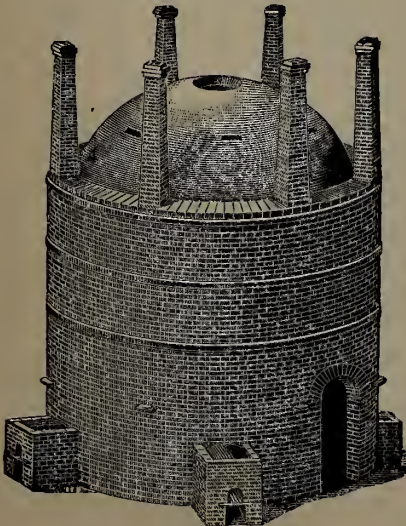
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 8 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

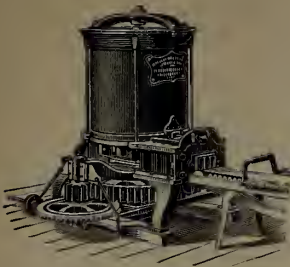
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

64 Johnson Building,

CINCINNATI, OHIO



(No. 7 S Brick and Tile Machine.)



(No. 2 E h. p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

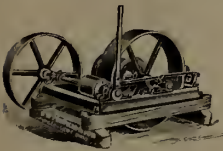
CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

Dry Cars;
Clay Cars;
Turn
Tables
and
Kiln
Castings.

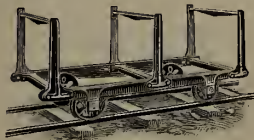


Pulleys;
Shafting;
Hangers;
Barrows
and
Yard
Supplies.

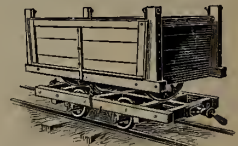
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



(Dry Car.)



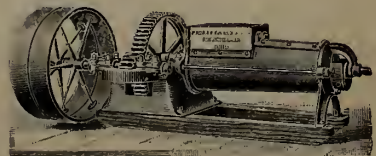
(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.

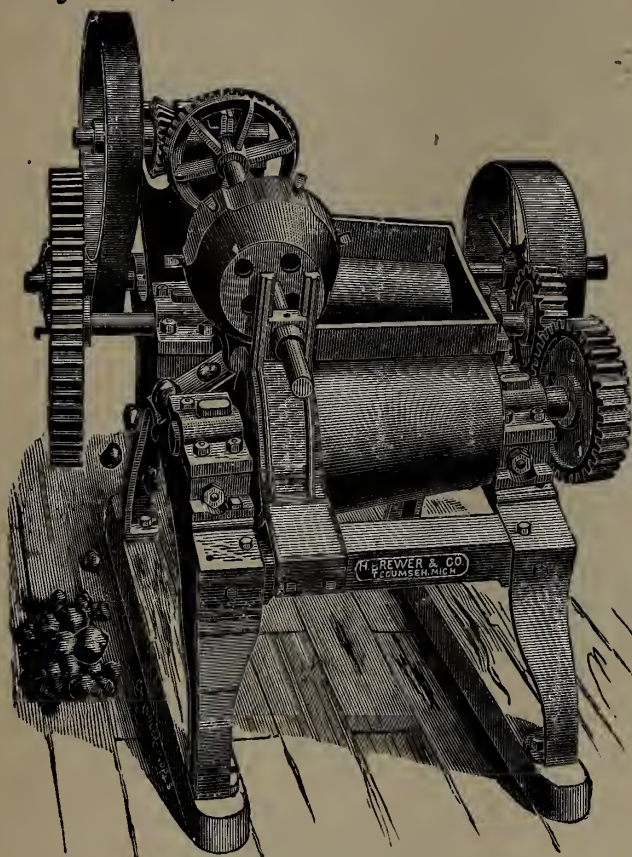


(No. 3 Crusher.)



(No. 7 Pug Mill.)

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

The following are among the advantages claimed for this form of construction:

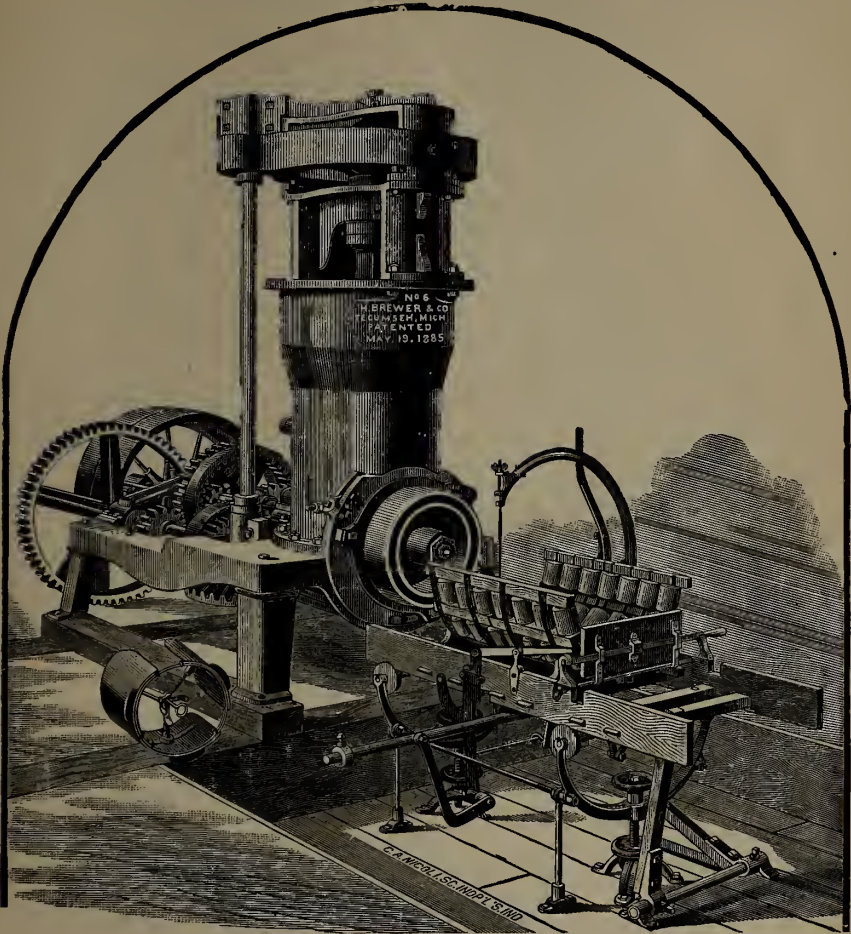
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.
H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Yours Truly, M. J. LEE.
Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Joliet, Ills., March 28, 1888.
Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

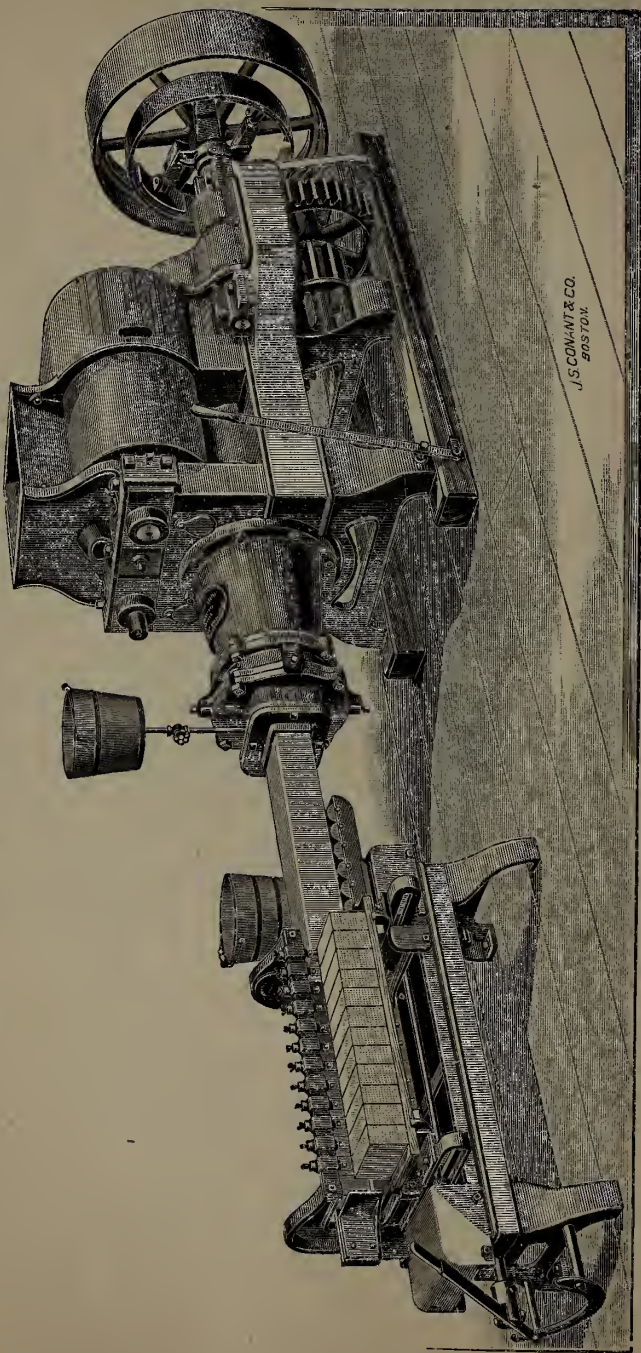
Yours Truly, JOLIET MOUND DEAIN TILE CO.
The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



"A" or Largest Size Machine with New Board Delivery Cutting Table.

Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

E. M. FRIESE & CO.,

PLYMOUTH, Richland County, OHIO.

[Mention this paper.

TRANSIT LEVEL

FOR THE USE OF

ARCHITECTS AND
BUILDERS.

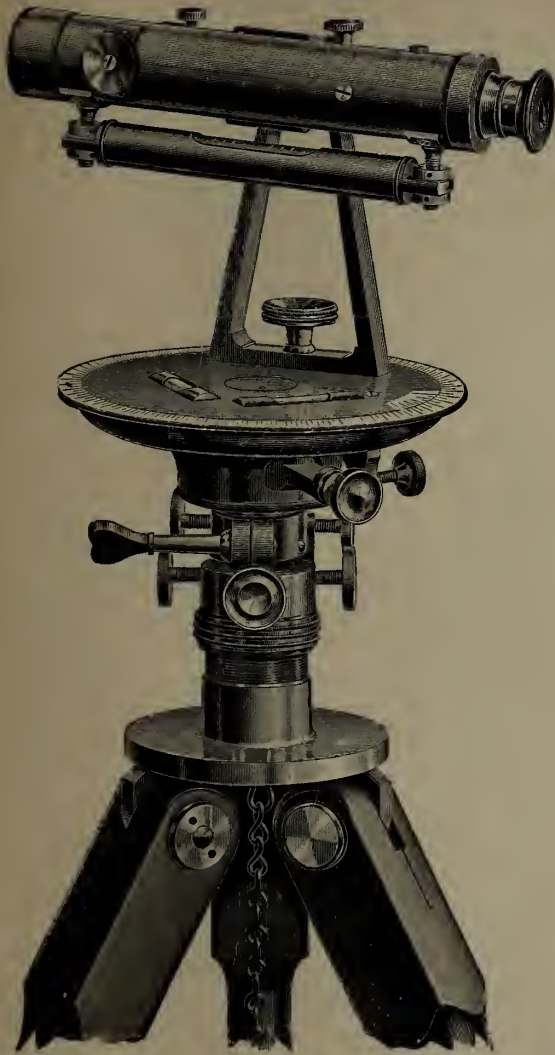


FIG. 11.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

T. F. RANDOLPH,
Surveyors' and Engineers' Instruments,

51 West Fourth Street, Room 31.

CINCINNATI, OHIO.

This is a new, light and convenient instrument for leveling and taking horizontal angles without the Magnetic Needle attachment, intended for architects and builders uses.

The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

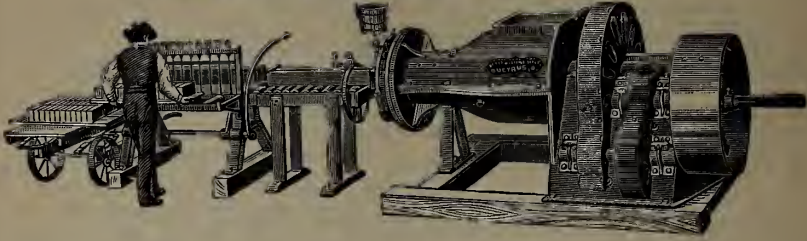
Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and $2\frac{1}{2}$ in my catalogue, the price would be \$60.00.

Send for Catalogue.

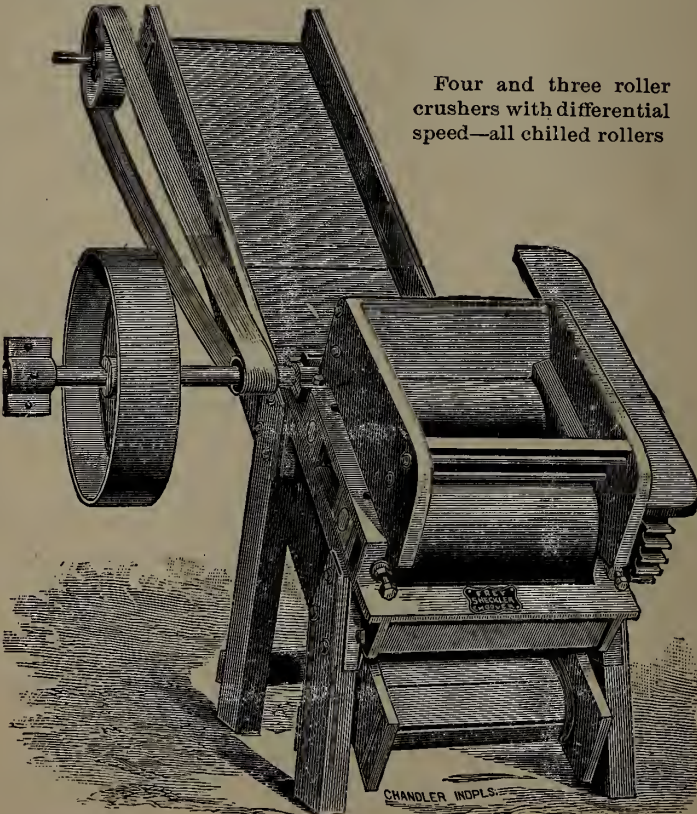
FREY--SHECKLER CO.

BUCYRUS, OHIO.



- The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.
- The Mascot—the lightest running.
- The Centennial—the best clay mixer.
- We furnish full outfits for brick and tile factories.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.



Four and three roller
crushers with differential
speed—all chilled rollers

Six Different Brick Machines; four Different Tile Machines
Crushers, Represses, Kiln Doors, Kiln Irons, Grates,
Brick Moulds, Steam Pipes, Brass Goods, Etc.

CHANDLER INOPLS.

We make thirteen different patterns of Roller Clay Crushers.
Send for catalogues and circulars to

THE FREY-SHECKLER CO., - Bucyrus, Ohio, U.S.A.

BRICK AND TILE MACHINERY.

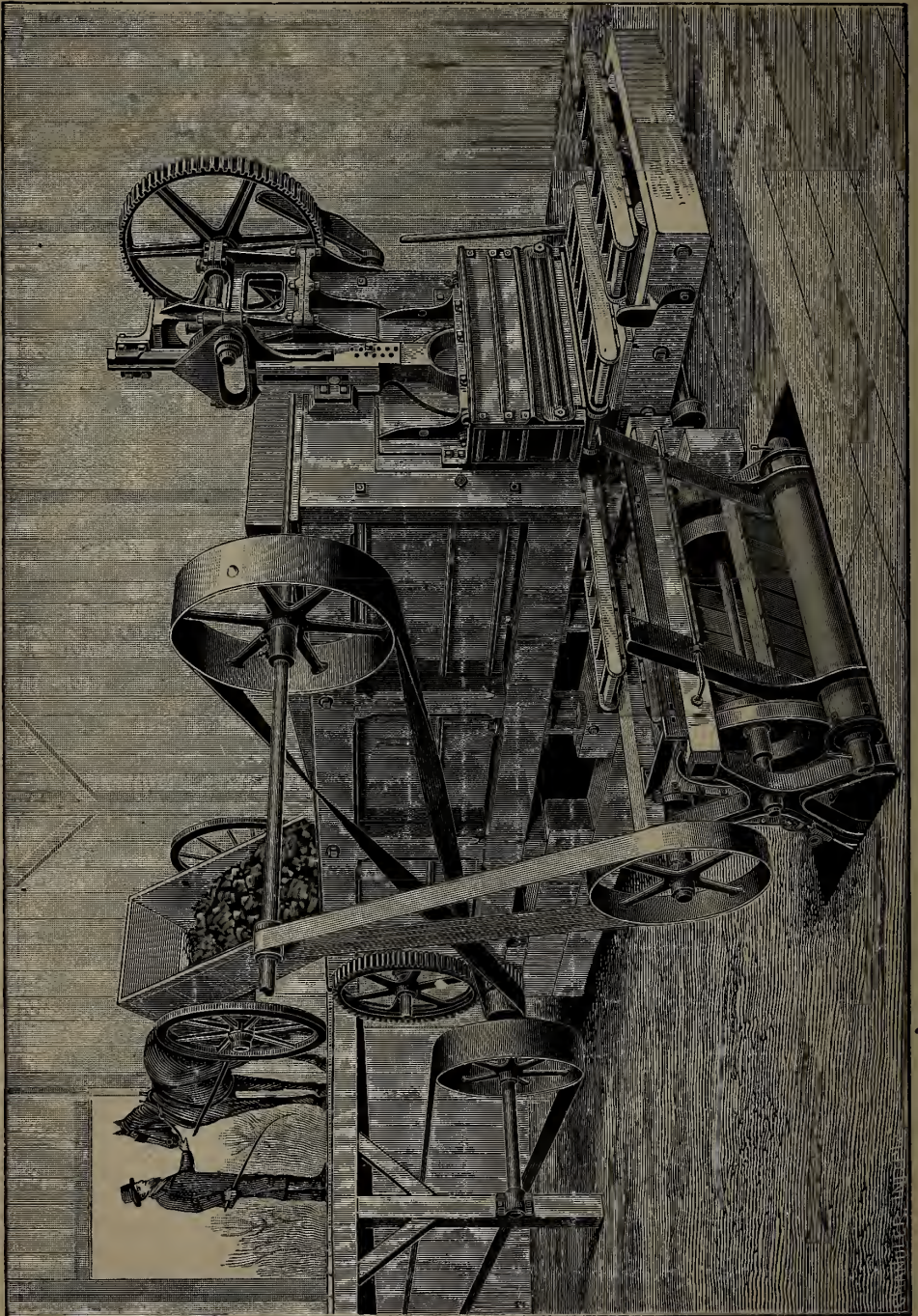


New Machinery, new Clay Conveyor, new Automatic Cutting Table,
specially adapted to cutting paving brick.

Write for Catalogue and information. Address

**Adrian Brick & Tile Machine Co.,
ADRIAN, MICH.**

Advertisements.



The Potts Horizontal Stock Brick Machine.

Requires no extra Pug Mill to work the clay direct from the bank.
It has the largest tempering capacity of any machine on the market.

All brick made have clean, smooth surfaces and sharp corners.

It works the clay stiff enough to make the finest Stock Brick.

Our Mould Sander, shown in cut, has taken the lead of all machines for this purpose. There is no place for the moulds to catch and cause delays. It will not spill or waste any sand. It is easily and quickly adjusted to any size mould.

NOTICE:—A. H. Newton, of Cohoes, N. Y., claim our machine is an infringement on patent owned by them, and that persons using our machines will be prosecuted. As to this we would say, that we do not infringe said patents; that we have put our machines on the market only after a careful investigation to ascertain exactly what our rights are in the premises, and, being fully satisfied of our rights, we are prepared to protect our customers and Patents No. 397,274, of Feb. 5, 1889.

We are prepared to erect complete plants of any desired capacity and keep in stock a full line of **Brick Machines, Pug Mills, Disintegrators, Mould Sanders, Clay Cars and Drums.**
It will pay you to write us for prices.

C. & A. POTTS & CO.,

Write for 1890 Catalogue—Just Out.

INDIANAPOLIS, INDIANA

NEW DEPARTURE TILE MACHINE.

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

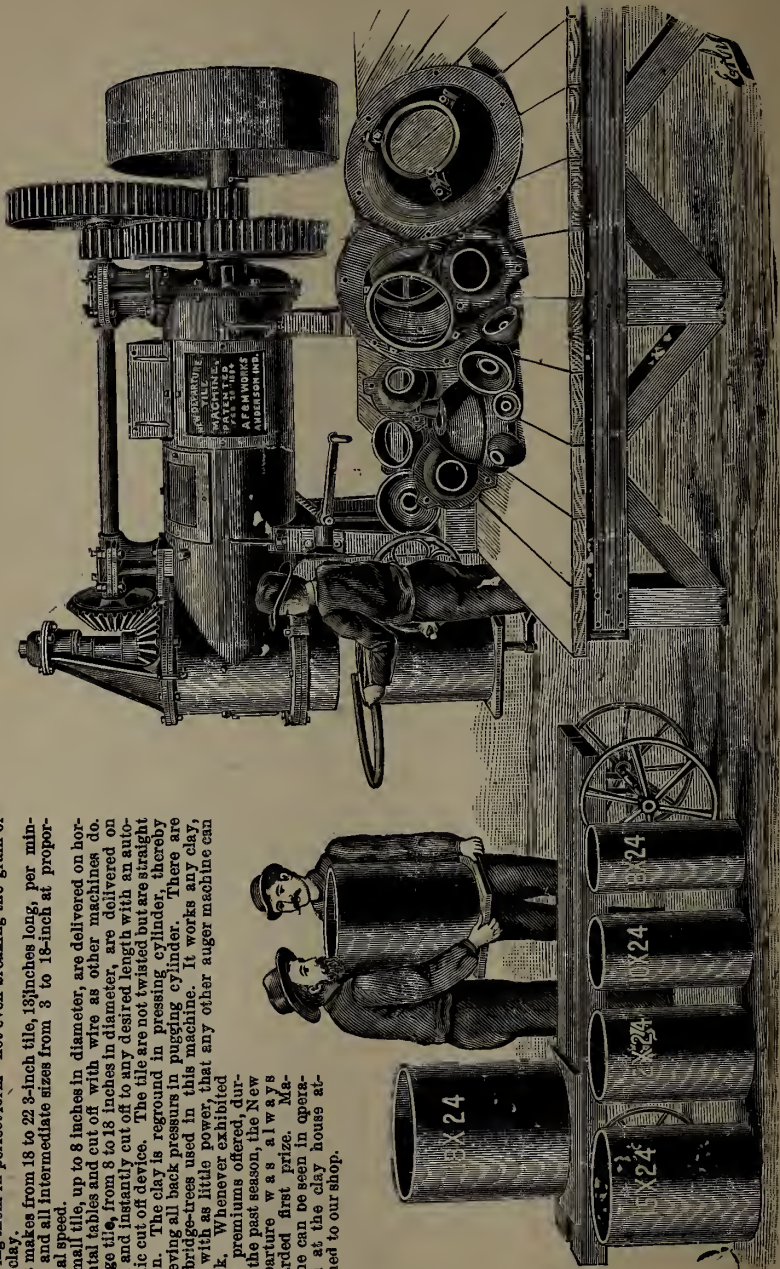
It makes from 18 to 22 8-inch tile, 13 inches long, per minute, and all intermediate sizes from 3 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressures in pugging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power, that any other auger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be seen in operation at the clay houses attached to our shop.

For full information and circulars, address:—

ANDERSON FOUNDRY & MACHINE WORKS,

Anderson, Ind.



A MAMMOTH CHRISTMAS BOX

(sent out to introduce our goods)

contains 100 Cakes (full size) "Sweet Home" Soap, enough to last an average family one year, finest made for all household purposes; also five boxes—3 cakes each—exquisite toilet soap, six boxes boraxine, perfumery, sachet powder, toilet requisites, and a large assortment of useful articles adapted for Christmas Presents; also toys, playthings, etc., etc., for the babies and many valuable and amusing things for older folks.

The price of entire box complete is six dollars, payable after 30 days' trial; (only one box sold to a family). If not satisfactory, we take goods back and make no charge for what you have used. We sell only direct from factory to family. (No middlemen.) We are reliable, ask your banker. Order now, you run no risk.

Some people prefer to send cash with order—we do not ask it but if readers of this paper remit in advance we will place in the box in addition to all the other extras a set **SIX SOLID SILVER TEA SPOONS**—plain pattern such as your grandmother used—very rich and elegant—will last a life time. This special offer is made with the understanding that you will recommend "Sweet Home" Soap to three or more friends (provided the goods prove all we claim) these spoons are only given to you because we believe your influence and future trade will be especially valuable to us (one box shown by our customers has often sold twenty others; to secure your permanent trade and recommendation to others in our behalf, we can well afford to lose money on first box we sell you). *Persons remitting in advance can have their money refunded without argument or comment, if the box does not prove all they expect.*

Factories: Seneca, Heacock,
and Carroll Streets,

J. D. LARKIN & CO.,
BUFFALO, N. Y.

Established 1875.
92,000 Boxes sold in 1889.

THE WALLACE MANUFACTURING CO., Frankfort, Ind., U.S.A.

"LITTLE WONDER."

—MANUFACTURERS OF—

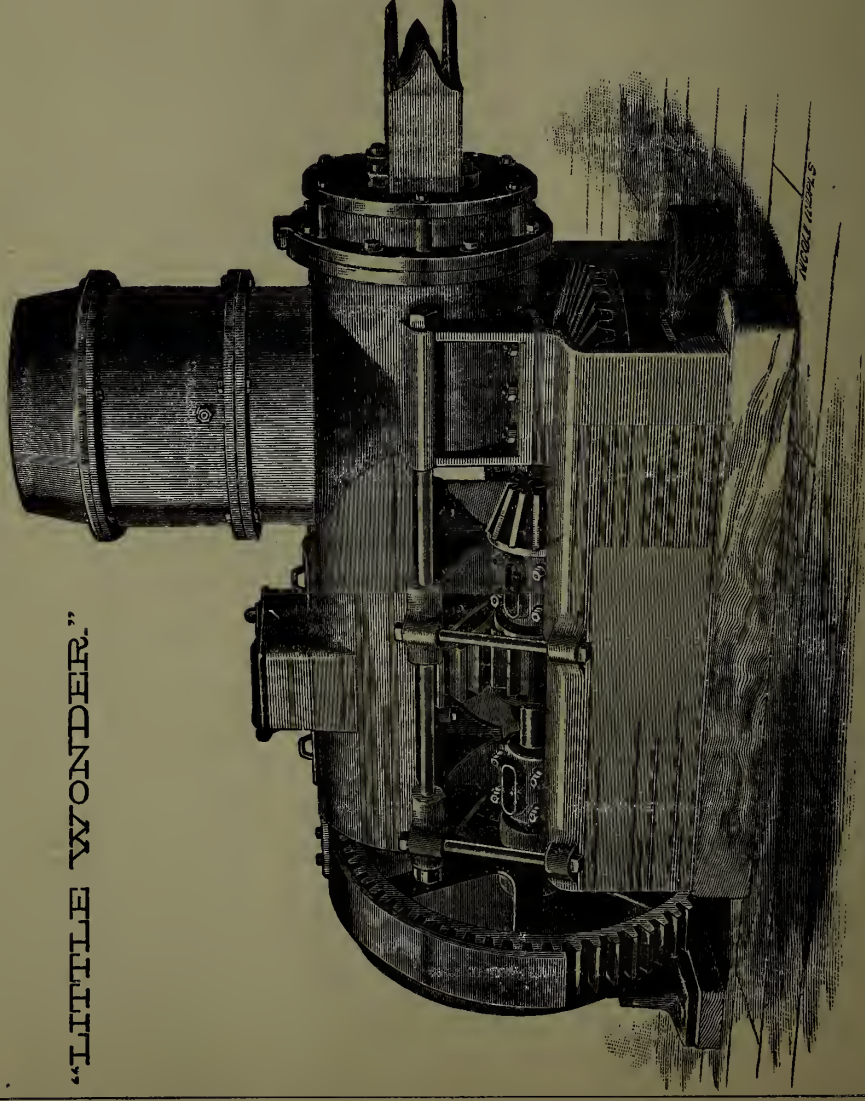
LITTLE WONDER TERRA
COTTA LUMBER, BRICK
AND TILE MACHINE.

WALLACE PATENT CLAY
CRUSHERS AND STONE
SEPARATORS.

WALLACE PATENT PUG
MILLS.

PLATFORM SPRING BAR-
ROWS FOR BRICK AND
TILE AND A FULL LINE
OF CLAY WORKERS'
SUPPLIES.

CORRESPONDENCE SOLICITED



A MAMMOTH CHRISTMAS BOX

(sent out to introduce our goods)

contains 100 Cakes (full size) "Sweet Home" Soap, enough to last an average family one year, finest made for all household purposes; also five boxes—3 cakes each—exquisite toilet soap, six boxes boraxine, perfumery, sachet powder, toilet requisites, and a large assortment of useful articles adapted for Christmas Presents; also toys, playthings, etc., etc., for the babies and many valuable and amusing things for older folks.

The price of entire box complete is six dollars, payable after 30 days' trial; (only one box sold to a family). If not satisfactory, we take goods back and make no charge for what you have used. We sell only direct from factory to family. (No middlemen.) We are reliable, ask your banker. Order now, you run no risk.

Some people prefer to send cash with order—we do not ask it but if readers of this paper remit in advance we will place in the box in addition to all the other extras a set **SIX SOLID SILVER TEA SPOONS**—plain pattern such as your grandmother used—very rich and elegant—will last a life time. This special offer is made with the understanding that you will recommend "Sweet Home" Soap to three or more friends (provided the goods prove all we claim) these spoons are only given to you because we believe your influence and future trade will be especially valuable to us (one box shown by our customers has often sold twenty others; to secure your permanent trade and recommendation to others in our behalf, we can well afford to lose money on first box we sell you). *Persons remitting in advance can have their money refunded without argument or comment, if the box does not prove all they expect.*

Factories: Seneca, Haccock,
and Carroll Streets,

J. D. LARKIN & CO.,
BUFFALO, N. Y.

Established 1875.
91,000 Boxes sold in 1889.

THE WALLACE MANUFACTURING CO., Frankfort, Ind., U.S.A.

"LITTLE WONDER."

—MANUFACTURERS OF—

LITTLE WONDER TERRA
COTTA LUMBER, BRICK
AND TILE MACHINE.

WALLACE PATENT CLAY
CRUSHERS AND STONE
SEPARATORS.

WALLACE PATENT PUG
MILLS.

PLATFORM SPRING BAR-
ROWS FOR BRICK AND
TILE AND A FULL LINE
OF CLAY WORKERS'
SUPPLIES.

CORRESPONDENCE SOLICITED

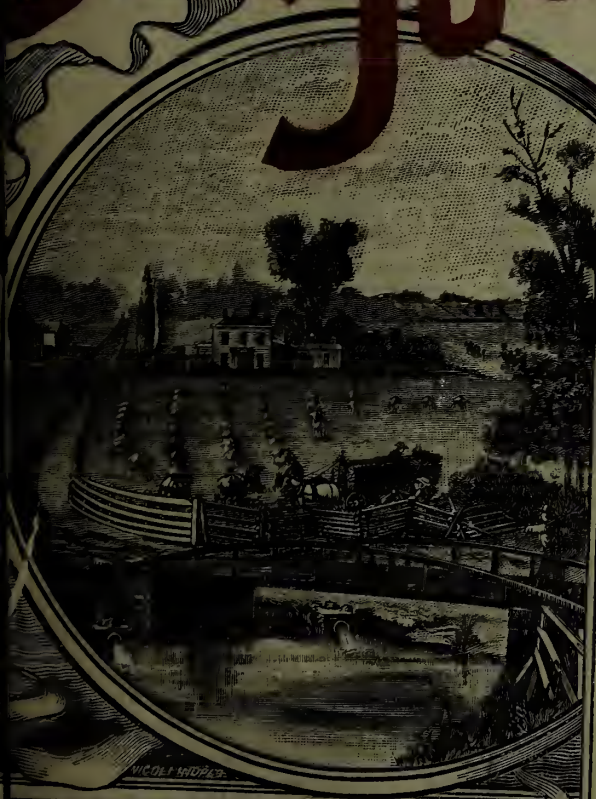


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10¢ PER COPY.
\$1.00 PER YEAR.

Vol. XIII—No.

THE DRAINAGE JOURNAL



MARCH, 1891.

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FARM DRAINAGE,
MAN'FR OF DRAIN TILE,
PROGRESSIVE AGRICULTURE
IMPROVEMENT OF HIGHWAYS.

J. J. W. BILLINGSLEY
INDIANAPOLIS, IND.

TILE MAKERS' SUPPLIES.



Cast Iron Kiln Cover.

No Down Draft Kiln complete without it.
TILE TRUCKS AND BARROWS, KILN BAND TIGHTENERS, KILN DOORS AND FRAMES, FURNACE FRONTS, LARGE DOOR FRAMES, CAST IRON COVERS, GRATE BARS, ETC., ETC.

Send to

D. J. C. Arnold,
NEW LONDON, OHIO.

For Illustrated Catalogue. [Mention the Journal.]

STEAM DITCHERS

For Steam Tile Ditching Machinery

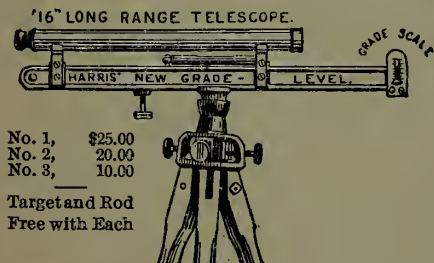
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The Streator Engine & Machine Works,
STREATOR, ILLS.



PATENTS.

C. P. JACOBS,
 Attorney in Patent Cases.
 60 EAST MARKET STREET,
 INDIANAPOLIS IND.



No. 1, \$25.00
 No. 2, 20.00
 No. 3, 10.00

Target and Rod
 Free with Each

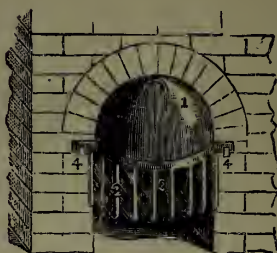
Do you Grade or Drain? If so, you need this Level.

Most Simple, Durable, Accurate. The Best.

Recommended by hundreds who have used it and some of whom you doubtless know. Their names and addresses, with full descriptive price list and illustrated circulars, sent free on application to parties who mention this paper.

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THE DRAINAGE JOURNAL

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TILE UNDERDRAINAGE FOR FARMS AND HIGHWAYS.

*BY C. W. MAYNARD, C. E.

The drainage of land is a subject containing great interest to agriculturists, land owners, and civil engineers, and should naturally be a matter of great interest to manufacturers of tile. Those contemplating the purchase of tile often ask the manufacturer questions difficult for him to answer. This paper is intended to give such information as will enable the tile manufacturer to answer leading questions.

The benefits of tile underdraining are now conceded by all intelligent men who have had any practical experience or observation in the matter, it being perfectly understood that even high lands, practically free from surface water, are, by being underdrained, benefited far more than the cost of laying the tile. This is accounted for by the fact that the ground will open earlier in the spring, allowing the plow to be put in two weeks earlier than in adjoining land not underdrained, and by the fact that the drains in time of drought give ventilation, if I may so use the term, to the land, enabling it to retain moisture, for the fact is well established that drains carry off all excess of water in wet seasons and retain and maintain moisture in the land in dry seasons. This may

seem paradoxical, but it is nevertheless a fact.

In underdraining roads the engineer should aim to accomplish two results, first, to underdrain the bottom of the road, second, to remove the water falling on the surface in the least possible time. If the roadbed is thoroughly underdrained, the action of the frost in loosening the gravel or macadam in the spring will not be noticed, as it will occur only on the surface, the bottom being kept dry and solid.

Having progressed thus far in general statements, let us now consider more particularly the proper way to proceed in draining land. The first thing to do is to employ an engineer, or the local surveyor, to take careful levels over the land, and from those levels determine a plan or system for drainage. Wherever a drain is to be laid a profile of the surface should be drawn and the working plan of the drain drawn beneath it. This enables the owner to know how deep the drain will be at any particular point, and affords a perfect datum for calculating the cost of digging the ditch and back-filling the same, and further, the length of the drain, and consequently the amount of tile required can be accurately figured. After this comes the most important part of the work,

SETTING THE GRADE.

In my practice I always set grade stakes every twenty-five feet, no matter

*Read before the Illinois Tile, Brick and Drainage Association, January 14, 1891.

how great or little the fall may be. In addition to this, I require the drain layer to be experienced, if not experienced, I educate him how to lay the tile, which is by drawing a line from the top of one stake to the top of the next one, the stakes being set two feet higher in the ditch than the inner invert of the tile, each tile carefully laid, butting close joints and laid at an exact depth of two feet below the line, carefully measured by a gauge stick which is simply a stick with a notch cut two feet from the end, which notch being placed on the line and the lower end of the stick on the invert of the tile at once shows whether the tile is too high or too low. As fast as the tile are laid the joints should be covered with coarse marsh hay, straw or a sod inverted, if the ditch be dry; if a wet ditch, clay should be carefully placed over the joints. In both cases this precaution should be taken to prevent dirt getting into the tile. Before the ditch is back-filled, fine, dirt or wet clay should be carefully tamped between the sides of the trench and the tile, and in deep cuts; those over five feet, not more than two feet of back-filling should be placed on the tile until after several days and a good rain has enabled the dirt to settle compactly around the tile. Great care should be taken in laying the tile to have the bottom in the inside make perfect joints, a want of uniformity or shoulders on the bottom of the drain will cause any mud which may get into the drain to lodge and form dams, which of course reduces the capacity of the drain.

The amount of water a drain of any given size will carry of course depends upon how much fall can be given to it. The greater the fall the better, as the greater the fall the smaller the drain may be. A 5-inch drain with a fall of six inches in one

hundred feet will carry more water than a 12-inch drain with a fall of one inch in one hundred feet. The proportion in the above case would be as 1.67 is to 0.80. That is to say, a 5-inch drain with a fall of six inches in one hundred feet will discharge when running full, one and sixty-seven one-hundredths cubic feet of water per second, and the 12-inch drain with a fall of one inch in one hundred feet will discharge, when running full, but eighty one-hundredths of a cubic foot of water per second.

The question may be asked in a general way, "How much fall should a drain have?" the reply should be, "As much as possible," but never less than one and a quarter inches in each one hundred feet, and then the drain laid by experienced, reliable men; and I should not advise a drain to be laid with a fall of one and one-quarter inches in one hundred feet of less size than six inches, and not then for a length of over six hundred feet. A fall of two inches in one hundred feet may be accepted as a safe gradient in a drain of any length, but of course as above stated, the size required for the drain will depend upon the fall and this can only be determined by an engineer familiar with this line of work.

Does it pay to employ an engineer? Most assuredly it does. A man who attempts to drain his farm himself is as foolish as the man who would attempt to prosecute a suit at law without employing a lawyer, and it is an old saying that "He who is his own lawyer has a fool for a client."

The fact should never be forgotten, that a drain properly laid will carry double the amount of water than another of the same size and fall carelessly and imperfectly laid. The best drain layers, unless the grade is set by an engineer, will get the drain in some places too low and in other places too high, commonly

termed "hog backs" and "sow bellies."

The writer has at this writing, just finished the work of taking up and relaying a 10-inch drain 1,350 feet long, laid by an experienced drain layer, an Englishman, who learned the business in the "Old Country." This drain did not do the work required, although a 6-inch drain properly placed would be of ample size. In taking up the drain it was found to contain four inches of mud.

Now, regarding the draining of roads. The drains should be placed under the ditch each side of the roadway, not in the middle of the road. The sides of the drains should be decided by circumstances. Where a drain must be laid for a length of half a mile or more with but one outlet on a fall of two inches in one hundred feet, the drain may be divided into four sizes of six, five, four and three inches, each being 675 feet in length, but where an outlet can be found every 600 feet or so, a 4-inch tile will be ample on each side of the road for underdraining. If, however, the road is so located that water from the adjoining land flows thereon after rainstorms, the size should be no less than six inches. In all cases I advise catch-basins to be located at convenient distances to permit the immediate entrance of storm water to the drains.

The particular and most important factor of underdraining roads, is to have the tile laid not less than three feet below the bottom of the roadbed, and four feet is still better. The reason why tile underdrains are of such great benefit to country roads is this: In the Spring when the springs and underground reservoirs are full the water rises and the ground becomes saturated, now, the water under ground can not raise above these drains, as they, of course, intercept it and carry it off. So also with surface water percolating through from the

surface, as soon as it reaches the drain it is rapidly carried away and prevents saturation of the ground.

In bringing this paper to a close the writer desires to give an illustration of the enhanced value given to land by proper underdraining.

The land west of the Desplaines River at and in that immediate vicinity of the Village of Maywood, ten miles west of the City Hall, Chicago, is a hard clay below the black loam of the surface. A syndicate, owning a tract of 160 acres which had been subdivided and platted into lots being designed as an addition to the Village, employed the writer to make a careful survey by levels, of the land and to design a plan for draining the tract. This tract lays more than a mile from the river and had to be drained to the river. Its elevation, above the river, is nearly 24 feet, with the exception of a large slough covering some 30 acres, which is about two feet lower. This slough has always been a favorite hunting ground for sportsmen, it being the resort of water fowl, and a great snipe ground. A main outfall drain was laid from the river to the land, and continued through the tract, and into this main and two other submains, lateral drains were laid. When setting grade stakes for drains through the slough the water stood two and one half feet deep. This was during last March, in one week after this drain was laid the pond on the slough disappeared and has never since reappeared.

The lateral drains are placed in each street leading to the main drain, and at each intersection of streets for catch basins. The lateral drains are eight inches in size for a length of 650 feet then six inches for a length of 600 feet. The main drain leading through the land is twelve, ten, and eight inches in size divided into equal lengths and the

sub-mains twelve inches. The main outfall drain to the river being a box sewer 18x18 inches formed in such a manner as to be self supporting, no spikes being used in its construction. The packing of dirt at the sides and the back-filling binding it tight together. The material used was hemlock plank two inches thick.

The cost of underdraining this tract of land into the outfall drain, was \$37 per acre, this included engineering and superintendence.

The result of this work has been two fold. The drains can be used as sewers for house connections and at the same time drain the land perfectly, and this accomplished, has virtually raised the land at least twelve feet above its former elevation. This land if not susceptible of drainage, would have remained worthless for any purpose except growing hay, and much of it entirely worthless, except as a sportsman's shooting ground. Having been reclaimed in the manner noted, its value has increased to a figure almost fabulous, and will in the near future be covered with dwellings.

ANNUAL ADDRESS.

Gentlemen of the Convention:

One of the great problems that agitated the minds of the agricultural class a few years ago, was in regard to finding some practical way of reclaiming the waste land. The introduction of the tile industry solved the problem.

Notwithstanding the growth of the tile business has been steadily increasing each succeeding year, last year (speaking particularly of the eastern portion of the State on which I am best informed) gave greater encouragement to the tile-makers than the previous four years, not so much on account of the increase

in the sale of tile as the increase of confidence concerning the benefits derived from its use.

It is not now necessary to recite a volume of proof to a man to convince him that it pays to recover his waste land by the use of tile. The practical workings of tile is open to the investigation of all, and the man that does not believe in tiling has to rebut both reason and the efficient workings of a practical test.

The old-time worn out questions and conclusion, such as: Will it pay to tile? Do you suppose I can dry such and such a place? Well, I have concluded to take a few, and if I find they answer the purpose, I will want more, etc. In a very large measure such talk is a thing of the past. I only know of one farmer who entertains a doubt as to whether or not tiling is of any practical benefit. Suffice it to say that man is using a Curby reaper and binding his grain in the good old way, and it will likely take him at least ten years yet to decide whether or not the self-binders are a success.

In short, gentlemen, the farmers are realizing the importance of draining their farms. Our customers do not buy tile to experiment, but to get the greatest possible benefit from their land.

Some are inclined to become impatient, and think that the tile industry has been slow in developing. If such will carefully note during the last few years how one improvement has succeeded another in the production of tile, how much the cost has been lessened, and of the almost incomparable amount used, he will, undoubtedly, to say the least, be somewhat surprised.

A few days since, I overheard a conversation which I believe is worth mentioning in connection with what I have just said, and will, to some extent, illustrate my point:

In 1872, a farmer in my vicinity, by the

*Delivered before the Iowa Tile, Brick and Drainage Association, February 4, 1891, by the President, J. V. Boling, of Stanwood, Iowa.

name of Henry Lehrman, conceived the idea of tiling a very miry slough, which in some seasons was dangerous for his stock to pass through. He began looking about for the cheapest and nearest tile, which he found to be at Muscatine, 43 miles distant. He commenced hauling at once. On his first trial, as he neared his home, he was met by a wealthy farmer, when the following conversation took place:

"What have you there, Mr. Lehrman?"

"I have drain tile. I am going to drain that big slough."

"What did you pay for them?"

"I paid \$62.50 per thousand for 3-inch tile."

"Well, you are a fool; you can never drain that slough with them things. You are wasting your money—putting it where you will never see it again."

But Mr. Lehrman went on and tiled 40 acres at that price, investing just \$1,000 exclusive of the expense of hauling and putting them in, and he told me that it made him money even at that enormous expense.

At the beginning of my remarks I spoke of my knowledge of the tile industry of the State being confined chiefly to the eastern portion of it. This is due to the fact that my only means of ascertaining information has been by personal visitation to various factories, or infrequent meetings with tile manufacturers. I have been unable to find any statistics which would give me a wider range of knowledge, neither of a national or State character. I have very often been asked such questions as, "How many tile factories are there in Iowa?"—"What is the annual production of tile and brick?"—"Where is paving brick manufactured?" etc. My answer has almost invariably been, "I don't know." Since this Convention is a State organization, the public rightly

expects a great deal of information, which, with our present sources of knowledge, is impossible to give. This strongly suggests to my mind the necessity of adopting some method by which we can have an annual report showing such results as shall be deemed beneficial by this Convention. I earnestly recommend that this Convention take some action looking to that end, at this session.

Now a word on railroad matters. Although I tried hard to get a reduction in fare to parties attending the Convention and have failed, I am not yet ready to jump on to that incorporation and find too much fault. We must not forget that railroads have a very extensive business, and they must have and maintain some rules governing their industry, and that they can't bend those rules to suit every circumstance. I find that the Northwest Passenger Association is at liberty to grant reduced rates to gatherings of this kind where they can have a reasonable degree of assurance that there will be at least one hundred in attendance, hence it devolves upon us to get up more enthusiasm, more interest, and increase our numbers beyond the reasonable number they require, then we will only have to ask for special rates to receive them.

It seems to me that we are receiving very reasonable freight rates on the transportation of our manufactured wares, so that we haven't any very good reason to complain. However, there is one thing which comes to my mind that I don't think is quite satisfactory, which is in regard to freight rates on nut coal. As I understand it, freight rates on heavy articles, such as coal, rock, wood, brick, etc., are regulated according to their commercial value. Since nut coal is 25 to 35 per cent. less value than lump coal we are certainly entitled to at least 20 per cent. reduction on the former kind

of coal. I laid this matter before the Railroad Commission last spring. Their reply was that nut coal had been represented to them as being of the same commercial value as lump, and if they found upon investigation that it was not, the subject would receive their immediate attention and that I would be advised of the action taken. I have not heard from them since, therefore conclude that it has not been acted upon. I suggest that a committee be appointed to confer with the Railroad Commission, believing that the above reduction can be obtained.

We have met for a mutual exchange of experiences. Each member is in duty bound to do what he can to make this meeting a success. Therefore, let each one give what information he can on the various subjects that are presented and not hesitate to ask for any information he may desire. On this mainly does the success of our meeting depend, always bearing in mind that it is necessary to be as explicit as possible. Hoping that we may have a satisfactory and profitable meeting to us all, I thank you, for your kind hearing.

WHAT HAS TILE DRAINAGE DONE FOR IOWA?

*BY HON. T. E. HAINES.

"What has tile drainage done for Iowa," is a question that has been asked quite frequently, but as yet has never been definitely answered, neither will I at this time undertake to give a definite answer to this important question, but will content myself with speaking of some of the general benefits resulting from the use of drain tile in Iowa. Any one who has traveled over Central Iowa in springtime twenty years ago and kept his eyes open will agree with me, that there was scarcely a 40-acre lot that did

not have on it more or less wet land, say from one to ten acres, and every one who has paid the least attention to agriculture knows that an acre of ground covered with water is entirely worthless; not only so, but immediately surrounding such pond there is another acre that is almost valueless, as nothing will grow upon such land but flags, rushes, and the coarsest quality of grass, which is comparatively worthless. Not only is such land worthless but it is a real nuisance, for besides being a place for breeding disease and the propagation of pestiferous insects, it is an eyesore to the farm and a hinderance in the way of the farmer, who, in plowing across his field is obliged to turn twice instead of once, the turns at the pond being usually made in mud above the horse's fetlocks, making the labor much greater than would be required to farm the whole, if properly drained. Now, with comparatively small expense, hundreds of such places in Iowa have been drained by the use of tile, and when spring comes they are found to be ready for the plow as early, if not earlier, than the higher lands, and straight furrows are made without a break from one end of the field to the other, and so with the labor of planting and cultivating, all have been greatly facilitated, and when midsummer arrives, the happy owner of the land will point with pride to the greenest spot in his field, where the most luxuriant growth of corn is now seen growing. Then when husking time comes, the large yield of sound corn is a rich reward for all the expense of draining. We have no statistics that will enable us even to approximate the number of acres reclaimed by drainage in Iowa, nor the gain in bushels of grain raised on that account. But let us draw a picture that will give us a faint idea of the vast amount of corn that is added to our sur-

*Read before the Iowa Tile, Brick Association, February 4, 1891. age

plus annually by the use of drain tile. Take a strip of the best portion of the corn belt, the entire length of our State east and west and one hundred miles wide. Now, if only one acre in fifty is reclaimed in this entire area, it will amount to 384,000 acres; on this small estimate of acreage we will estimate a yield of fifty bushels per acre, which is not a large estimate for such land, and we have an increase in the corn crop in this small portion of Iowa of 19,200,000 bushels. Now, if such great results are obtained in so small a portion of our State, great must be the result from tile drainage in the entire State, and I am more than ever convinced that the future prosperity and wealth of Iowa depends largely upon the thoroughness with which its broad acres are drained. For if our Iowa soil is thoroughly drained there is scarcely a possibility of a season being too wet to produce a fair crop of corn, and from our experience during the last three dry seasons we are not liable to lose a crop on account of drouth on these low moist lands that have been well drained, for in all these dry years I have seen forty to fifty bushels per acre gathered from such lands, while the yield on the higher lands was fifteen to twenty-five bushels. We, therefore, believe that though our Iowa seasons be extremely wet or extremely dry, we are almost certain of a reasonable good crop, while every Iowa farmer well knows what would be the result in either case on land not drained.

Having now shown that by the use of drain tile in Iowa our yield of grain has greatly increased, our farms have been beautified, the general health of our State promoted, and, as a result, the value of lands are greatly enhanced, and while we are enumerating the many ways in which Iowa has been benefited by tile drainag we should not neglect to say

that the vexed question as to how to make good roads over the level prairie of Iowa has also been solved by the use of drain tile. But, with this simple hint, I will leave this part of the subject, which will, no doubt, be thoroughly ventilated by our worthy brother from Tipton, who, I see by our programme, has been assigned to this particular part of the work.

But there is another question that might be asked in connection with this subject, which is almost as important as the one we have just been discussing, that question is: "What has tile drainage not done for Iowa?" Well, it has not been the cause of our dry seasons, as many unthinking persons have supposed, and a few cranks have even affirmed. The theory on that side of the question seems to be, that when we drain the ponds, we reduce the chances for evaporation, and thus fewer clouds will be formed, and consequently less rain. Now, if the presence of ponds is necessary to induce rain, why is it that the rainfall in Ohio, Indiana and other Eastern States has always so largely exceeded the rainfall in Iowa, with all its lakes and ponds. Again, let us refer back to the summer of '69, when the rivers of Iowa were spread out all over the bottom lands, and every basin in the State was filled to overflowing. Now, according to the "pond theory," as I shall call it, the great wonder is that it *ever* stopped raining, for, according to that theory, the more ponds the more rain, and the more rain the more ponds. But it did stop raining, and that before tile draining had scarcely been thought of; for, if my memory serves me right, it was the following summer that the rivers receded back into their channels, all the ponds went up in mist, formed clouds, and they were floated by the four winds to other lands, leaving our crops to suffer for

want of rain, and that was the most severe drouth Iowa has suffered for the last twenty-five years. Again, if the immediate presence of ponds is necessary to produce rain, why is it that the State of Michigan, which is almost surrounded by the great lakes, suffers as frequently from the effects of drouth as Iowa does? And with the numerous ponds and lakes all over the State of Minnesota, it too, has its dry seasons. Even the Pacific coast, with the great ocean spreading out before it, becomes so dry during a portion of each year, that the grass on lawns will turn brown and die unless it is kept alive by irrigation. So we are led to believe, that the immediate presence or absence of the different conditions above referred to, has but little to do with the amount of rainfall in their immediate vicinity, but that the rainfall throughout the world is controlled by a higher and more general law; I grant you that this may be altogether a natural law, but one which is so fixed that it is not in the power of poor finite man to change, or even to modify it.

FARM HOUSE 'NEATH THE HILL.

O! the farm-house 'neath the hill, I can see it
standing still,

As I saw it in my childhood's happy days,
When everything was new and beautiful to view,
From morning till the sunset's opal blaze.

I can see the orchard trees and I hear the hum of
bees

In the hollyhocks and roses near the wall,
And where the brooklet flows, a barefoot urchin
goes
Again among the cat-o'-nine-tails tall.

Down to the pasture spring I walk and lightly sing,
As happy as in merry days gone by,
When I wandered in the wood, half lost in solitude,
Or climbed the friendly mountains looming high.

How I love that farm-house wide, with its trees on
either side,
Where I played and laughed and wandered when
a boy!

I can see the swallows fly down the chimney from
the sky,
And again I dream a dream of vanished joy.

Wherever I may go, I'll find no place I know,
That will my mind with sweeter fancies fill.
Fond memory guard the door, and time pass gently
o'er

That humble, old, gray farm-house 'neath the hill
—Selected.

Farm Drainage.



KIND OF TILE TO USE.

First, as to shape. The horse-shoe shape has gone out of use. The round took its place, and now the kind that are six sided on the outside and round on the inside are taking its place, especially for the smaller sizes. They lie a little better in the ground than the round, especially if you have a flat-bottom scoop or cleaner for the bottom of your ditches. But I should get the round ones if they were handier to get or cheaper. They need not be porous to let the water in. For the water gets in chiefly at the joints, at any rate; probably more than ninety-nine hundredths of it, even in the case of soft tiles. About ten years ago I made some experiments and found that even the softest tiles would let very little water pass through them. I set several soft four inch tiles on end on plates and filled in and around the bottoms with plaster of Paris and let it harden. Then I filled the tiles with water brim full. At first the water sank rapidly about $\frac{1}{2}$ to $\frac{3}{4}$ of an inch till the pores of the tile were soaked full. Then the water inside stood at the same level, practically, for days in a

damp cellar. In a drying wind the water would evaporate *from the outside of the tiles*, and they would then drink up more. But the water would not *trickle down the tiles*, on the outside. As soon as the pores were soaked full of water the capillary attraction seemed to hold it right there.

Second, as to the clay and burning. Shall we use those made of common brick-clay, and rather soft porous, or those made wholly or in part of potter's clay and very hard burnt? The usual argument for soft tiles is that they ought to be soft to be porous to let the water in. But if you wish to learn how fast the water can get in or out at the points, set one glazed tile on end in plaster of Paris as above, and fill it with water. Then set another, it will not matter how smoothly set, set end on end on the first and pour in water from a pitcher. It will escape about as fast as you can turn in from the pitcher nose! Try it once and you will see how the water gets into the tiles.

I prefer to use only tiles made of potter's clay and burned as hard as a jug or crock. They will never perish in the ground; nor will they shell to pieces by rain and frost if lying on top of the ground. I have had the soft-burned tiles, made of ordinary brick clay, go to pieces on top of ground in a single winter, and the frost will effect them more or less wherever it is necessary to lay them shallow.

How to Dig: Some think "any fool can dig." Certainly not. To dig a ditch rapidly and with the bottom true in grade requires knack, practice, skill and a true eye. I usually do my grading as nearly as possible with the plow in the first two furrows run to mark each ditch. If these furrows (or the first one) are run early in the fall the fall rains will finish the grading. That is they will cut the high places and fill the low ones. Then if you hold

your spade always *at the same angle* in digging, and sink it always *to the same depth*, you will *preserve the grade*. The "top lift" or first course is best dug with a ditching spade with blade 16 inches long and six inches wide.

The "top lift" should be dug about 10 inches wide and 14 inches deep. This with a 6 or 8 inch furrow gives 20 or 22 inches of depth and leaves only 8 or 10 inches for the bottoming spade. One edge or side of the spade should be left *just out of the clay* to make the spadeful break off more easily. If you bury the spade completely, you have both edges of the spadeful to break off, and may break the spade or weaken it instead.

Some loose earth will fall off from the spade, and should be cleaned out with the cleaner.

The bottom spading is cut narrow in the same way only with a bottoming spade, cutting just wide enough for the given sized tiles.

The crumbs of earth are cleared out and a true groove is cut for the tiles with the drain-cleaner, an exceedingly handy "double-ender" tool that works to a charm for this purpose. The handle is some 8 feet long, and the angle is adjustable, so that you do not need to get into the bottom of the ditch.

Then with the tile-hook lay the tiles in the groove, turning each if necessary to get a good joint. Sometimes the tiles are curved slightly. They should never be laid so as to rock, as that makes them liable to be displaced in filling the ditch with earth.

Sprinkle in fine clay carefully around the tiles. Then fill about six inches and tramp with the feet; then fill the rest without tramping and heap up the earth, around it up along the ditch to give it a chance to settle with the frosts and rains.—*W. I. Chamberlain, in National Stockman and Farmer.*

SELECTING SIZES OF TILE.

There are extremes in the use of sizes of tile. Some insist that the sizes used are too large and others that they are too small. It is hard to meet the opinions of all.

But it is true that in this and in adjoining States there are many lines of tile being taken up and replaced with larger tile.

It is very probable that the want of capacity in some of these lines of underdrains is the want of skill in their construction. Indeed we think it probable that many of these lines would be found to do the work if well laid.

There is, however, a very considerable difference as to the size of tile required to make efficient drains in different kinds of soil. A close, retentive clay soil requires that the lines of drains be laid closer together, hence it follows that the sizes of tile may be smaller. Then the depth of the drains has something to do with the sizes of tile used. A drain laid $3\frac{1}{2}$ or 4 feet deep will allow the water to pass down into the soil so as not to damage the roots of crops and pass off through the tile slowly; in such cases the sizes of tile may be smaller than where the depth of the drains is not sufficient to allow the water to pass below the feeding roots of the crops, then the tile should be large enough to admit of the water of heavy rainfalls to pass off quickly.

Again, the character of the soil has much to do with the sizes of tile necessary to the most efficient drainage. If the soil is open the underdrains will draw a much wider space in the soil—taking more water—requiring larger tile than where the width drained is much less.

Again, the sizes of tile used must be determined in part by the amount of water likely to flow on to the surface drained from higher ground.

Again, in the selection of sizes of tile the fall will have much to do—the greater the fall the faster will be the flow and the smaller the tile required.

Lastly, the efficiency of the work of laying the tile has much to do with the capacity secured. A well laid line of three-inch tile may be more efficient—carry off more water than a four-inch line imperfectly laid. To lay the three-inch line well is the better economy.

QUESTIONS IN TILE DRAINAGE

When soft tiles are used a hole can be pecked in the larger or main tile with a small sharp-edged hammer, for the lateral to enter: It takes a good many light blows and some skill to cut the hole without breaking the tile. It should be done with care and a good joint be made. But now makers both of soft and hard tiles are furnishing junction tiles with the holes *cut before* the burning. It takes but a moment to cut the soft, plastic clay. It makes a much better junction hole, and far easier. The best way, however, is to get the hard tiles made with regular T and Y joints, molded like sewer pipe joints, before burning. Either of these two make a perfect joint, and there is really not much choice between them, only if it is more convenient for your laterals to enter your mains at a right angle, you want the T joints, and if at an obtuse angle, you want the Y joints. And I do not myself think it makes much difference which you use. If it is more convenient to get the Y joints, and your laterals are right angles with the mains you can *curve* the lateral down stream for a few feet before it enters the Y. Some think it important that the water from the laterals enter an obtuse angle, to give it an impulse down stream, but it will find its way down hill in the main tile if it once gets in, whether at an acute angle or a right one.

Outlets: These should always be kept clear and have some little fall into the open ditch which they enter. The English call them *out-falls*—perhaps to indicate that there should be a fall at the opening. There should be as few outlets as possible, and each should be bricked or stoned up around it to keep the earth up in shape. I say the outlets should be as few as possible. This object is secured by running as many mains and laterals as possible into one final large main. I have now some 30 acres whose water discharges through five outlets; one six-inch one, two five-inch and two four-inch ones. But in the spring I intend to join the five into one. A future number will give a diagram of the system.

Catch-Basins: The field of which I am now completing the drainage (over 36 acres) has a broad valley running slanting through it. The water from about 100 acres finds its way down this valley. If I let it run down through it it injures the crops sometimes and gullies the ground. Just above the field are two artificial ponds, one covering about a quarter or third of an acre and the other about an acre. They serve as regulators in high water. Unless the dam of the larger (and I intend to have one under the smaller soon) is a two-inch iron pipe with a globe valve-gate, connected below by a catch basin with a six-inch drain that runs clear through this 36-acre field. If a heavy rain sets in this valve is opened, and the six feet of pressure in the pond drives the water out at a rapid rate. When the overflow from the two ponds begins it is received into a smaller pond below, about two rods square in which is a twenty-inch sewer pipe catch basin sunk four feet deep. Three feet deep is the six-inch outlet which has a "trap" or goose neck *curving up* about eight inches and then down about the same into six-inch tile drain. This trap

is to prevent any light straw, chips, small sticks, etc., from getting into the drain and stopping it. Before I had this trap arrangement the drain got stopped by rubbish once and I had to take up about 100 feet of it. This is the best way I know of handling a large amount of surplus water coming from land lying above. But for this means there must be an open ditch, which would waste much land and make two awkward triangular pieces of land instead of one large rectangular field. But for the two ponds, the iron pipe under the dam and the catch-basin and little pond, which gives four or five feet of vertical pressure, but for these things it would take a twelve or fourteen-inch tile to carry the water in flood time. As it is the six-inch tile does the work, by starting the valve, lowering the pond, and spreading the surplus out over the two ponds which can rise a foot before going over their dams, and finally by putting the strong vertical pressure on in the catch-basin and little pond, which drives the water through the six-inch tile drain with great velocity. I should add that this drain has an average fall of over two feet to the hundred feet. The two larger ponds were made for water and ice and fish ponds, but serve an excellent purpose as balance wheels, so to speak, or regulators for storage of surplus.

Silt-Basins. "Silt" is the fine sediment or mud that in some soils will work into tiles with the water. Waring and other writers advise a silt-basin of brick or sewer pipe 24 to 36 inches in diameter, and running a foot or two below the level of the tile drain, to be used every few hundred feet in the main drains; from this the silt can be removed. In my clayey soil the silt does not trouble, but I have used a silt-basin as a sort of collector of laterals at one joint in my system. It is sewer pipe made to order;

is two feet in diameter, and has five inlets and one outlet; three four-inch inlets, two two-inch ones and one seven-inch outlet. It is at least a satisfaction to remove the cover and see all five drains pouring their clean water into this catch-basin and the one large one taking it. The squares of the five inlets (16, 16, 16, 4 and 4), added, equal 56 inches. The square of the seven-inch one equals 49. Theoretically the water carried is as the square of the diameter. But as there is more friction and less pressure in the smaller ones this larger one will always carry all the water they can give it.—*W. I. Chamberlain in National Stockman and Farmer.*

THE DRAINAGE SYSTEM OF LOUISIANA SUGAR PLANTATIONS.

BY F. L. DELFER.

[CONTINUED].

The first winter I was down here the river never came out of its banks, and I felt rather disappointed by that. My first look at high water in Louisiana I got last winter as one day I accidentally climbed up on the levee on the Willswood plantation, and came near plunging into the water on the other side, which was within two feet of top of levee. I then thought and said at once, that I had seen enough, and was willing to see the river go down again. But it did not go down, but continued to rise until it was even with the top of the levee, and had it not broken in so many places the water would have run over the top in a continuous sheet, for many miles. Even as it was, boards were staked down on top, and sacks full of earth packed against them. The wonder to me there was, and is yet, how such a frail embankment could hold back such an unruly waste of waters, where the wind dashed waves against it like those on a lake. The worst place on this, the

Armant plantation, was, where the levee made a turn at right angles, and there the white caps fairly danced on the waters, and the spray and thin sheets of water were continually thrown clear across the road. A stranger would not have thought that this same corner was the pasture ground of the mules in normal times. I had often heard that trees and logs sometimes bore holes into the levee, and I have often seen them come against the levee, again and again on the same place, like a thing of life, that tries to break through its barriers. I often thought of Schiller's words, "Den die elemente hassen, die gebild von menschen hand." (The elements hate the works of men).

But I believe I started in to tell about the drainage system, and I must return to my subject. The leading ditches referred to in a former article as running at right angles from the river, or, as we say here, from the front back, are about 100 feet apart in a well drained plantation, and, besides, there is a ditch on each side of the road. On a sixteen acre field this makes nine ditches, four acres, or 340 feet long, total 7,560 feet, or 458 rods, or 28,396 rods to a plantation of 1,000 acres. This does not include headland ditches or cross canals, which sometimes occur in every block. If we assume that there is one only in every other block, we get about 2,000 rods more, or a total of over 30,000 rods. The weeds are cut out of these ditches every year, and a foot of dirt, sediment that has washed in, has to be thrown out every other year, and in some kinds of soil every year. Immense as these figures look, these are not all the ditches yet, because there are small ditches, about a foot wide and deep, feeders to the leading ditches. The ground is ridged up so high, almost 18 inches, around the cane, and the soil so tough,

that the water would stand between the rows after a heavy rainfall, and this would "scald" the cane. So these little ditches called "quarter drains" are made. They are from half an acre to an acre apart, and if the former, there are as many rods of them as of the leading ditches, or another 28,000 rods on a thousand acres. These quarter drains are dug out good every spring, and shoveled out after each one of the four or five plowings which the cane gets. Even with the cheap negro labor the yearly expense to keep all those ditches open, is immense, and there is nothing but a sugar plantation that could stand such a continual outlay, and even they feel it very sensibly. It is of course only a question of time, when tile drainage will be substituted for open drainage, and, at first sight, it seems strange that this has not been done to a greater extent already. But to one who has seen the small beginning and feeble struggle of tile drainage in the Western States, as I have in Iowa and Illinois since 1870, it is really only a repetition of the experience there. It was not so much the farmers who started in the business of their own accord, but the tilemakers and ditchers had to talk them into it; then the farmers would make a small start that cost them perhaps a hundred dollars or so, by tiling some mean crooked slough that cut up an otherwise good field; next year he would do a little more, the year after a good deal more, until finally they went at it by the wholesale. Here, people had the idea that they could do no good unless they laid tile about 30 feet apart, and that would cost them much more than the land was worth. Besides they thought that tile would not be a success in this kind of land at all, and after they had tiled the land and closed the open ditches they might have to dig their open ditches anew, and lose

a crop of \$100 to \$150 per acre in the bargain. But now we have shown by experience, that better results are had with tile 100 feet apart, than with open ditches at that distance, and that lands can be tiled at a cost which will give the planters an interest of 50 to 100 per cent. on the money invested. It is but reasonable to suppose, that from now, the industry will advance farther. But if Congress should rescind the sugar bounty law, without restoring the former tariff, it would be but a question of a few years till nearly the whole sugar planting would be wiped out, as the planters can hardly keep their own under the present system.

St. Patrick, La., February, 1891.

P. S.—The last monthly meeting of the Louisiana Sugar Planters in New Orleans, February 12, was devoted to the discussion of tile drainage, at the instigation of the President of the Association, Mr. John Dymond, Sr. Many members were present who showed great interest in the proceedings. Essays written by J. K. Tucker, Adolph Thiel, and the undersigned were read, and a discussion followed afterwards. Undoubtedly a great deal of good will come from this meeting.

F. L. D.

DRAINAGE AND PLANT FOOD.

BY D. W. STOOKEY.]

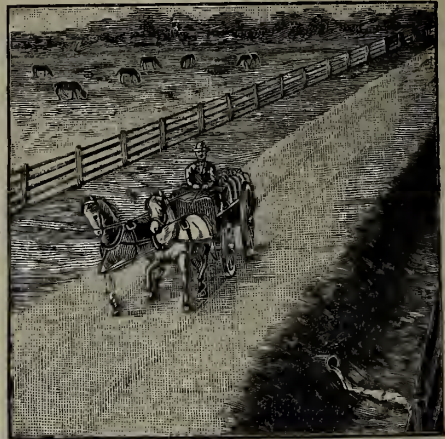
Soils in order to be fertile must contain the chemical elements and compounds that go to make up the plant, and these must exist in forms that can be taken up and appropriated by the plant in its growth. Tile drainage assists the chemical preparation of plant food in the soil in various ways. Drained soils are several degrees warmer than similar soils not drained and as heat is an important agent in producing chemical action, the changing of the constituents of the soil into available plant food is facilitated by the increased heat consequent upon tile drainage. The

water is taken out of the spaces between the particles of the soil by drainage and the air is allowed to enter instead. This admitted air with its attendant gases, such as carbonic acid gas, ammonia, etc., acting upon the soil has an active influence in making it mellow and porous. By being thus mellow and broken up into small pieces, there is much more surface exposed to the action of the air and its gases. They act upon these exposed surfaces, disintegrating the mineral constituents of the soil and new chemical combinations between them and the gases of the air are formed, some of which are in fit condition to be utilized by the growing plants.

Roots, manure and other organic matter must pass through certain processes of decay before they can be used by plants for food. It is a well known fact that roots or any form of organic matter decays very slowly under water but rapidly in moist air. In undrained soils, with water standing on or near the surface, this decay is very much retarded and instead of the perfect decay and consequent preparation of wholesome plant food the slow, imperfect decay under water produces sour, acid combinations that are injurious to the healthy growth of our cultivated crops. By being drained and in a porous, mellow condition the soils admit the water of rains. This water contains a greater or less amount of gases absorbed from the air which with the water acts upon the soil both chemically and mechanically. Mechanically they are advantageous by washing and carrying in solution the particles of the soil, thus changing their relative positions and by bringing them together in new relations, new chemical changes are made possible.

THE free passage of the water down into the soil and subsoil also serves to utilize manures and fertilizers that have been spread upon the surface.

Road Drainage.



A SCHEME FOR ROAD IMPROVEMENT.

Roy Stone, in a recent letter to *The New York Tribune*, said:

Recent discussion of ways and means for the improvements of country roads has resulted in some local legislation of value, notably in the new county road law of this state, and a wider agitation of the subject might develop a practical national scheme of road improvement. It would be easy to show that in this country the burden of bad roads is the heaviest tax imposed, and in many districts heavier than all others combined, and that no higher boon could be asked of the government than to bring our highways promptly up to the European standard of perfection, if it could be done without hardship to individuals or localities.

The new law of this state empowers the county supervisors to assume control of any road in the county, decide upon a plan of improvement, employ an engineer, issue 6 per cent county bonds running twenty-five years, and to tax the county for interest and principal of the bonds, for the annual repairs of such road.

This is using the lowest form of public credit, with a corresponding high rate of interest and repayment by one generation, and would be onerous if it were just, but it is unjust to that part of the county not benefited, and to the generation taxed for a permanent work.

It is not even likely to secure the most skillful method and economical appliances for the work. In a wider scheme considerations of economy, efficiency and equity would seem to require:

1. National finance to secure the lowest rates of interest, uniform in all the states, and the longest term of repayment.

2. State control of disbursement under some form of national supervision; a permanent organization of trained experts, etc.

3. Local option for each local application of the scheme.

4. Equitable distribution of the interest charge between the nation, state and district and a local adjustment in the latter according to benefits directly conferred. For example, the nation borrowing the money at $2\frac{1}{2}$ per cent, might loan it to the state at 2, the state assess one-half of this upon the township applying for improvement, and the township apportion its share chiefly upon the land actually benefited.

Not taking into account repayment of the principal, which could be indefinitely postponed, this would reduce the local burden to one-tenth that imposed by the New York law.

ABOUT ROADS.

Cannot something be done for the improvement of our public roads? At present we have great expense with unsatisfactory results. Possibly we are deterred from making the attempt by looking beyond what may be required. A few suggestions:

FIRST—Elect for supervisor or super-

intendent of roads a man of some thought. Let him be free from petty town politics. Give him funds to pay cash for labor at what it is worth. Furnish him with a grade level at the small cost of \$20, so simple and plain that any man with sufficient head for his position can use without difficulty. With this help every grade and gutter can be made to carry off its water. Hold him responsible to a reasonable extent for allowing water to run on, over, or along middle of driveways, as often a few hours work would save a very bad road, especially during winter and spring. Let every new road be laid out straight as possible, with the best grade to be had.

SECOND—Carry off all water from under road beds, as no farm land or road can be profitably used with water raising to the surface, which can be done effectually and at moderate expense by the use of drain tile, which, if properly lain with level, will last for generations.

THIRD—Get rid of water from surface of road by making a smooth face with sufficiently elevated centre to readily carry water falling thereon to a straight, smooth graded gutter on each side, which is readily gotten by use of a *level* and *good road* machine, well managed.

FOURTH—Have all small streams, springs or low places in gutters carried at sufficient depth under road bed by a substantial stone culvert, or which is better, drain tile. Have no gutters for wheels to carry moisture and water along road, which in heavy rains soon makes channels for water to run in, besides the wear and tear on vehicles and persons traveling.

These steps so briefly set out—being taken, the great majority of our country roads will be quite good. When low, soft grounds are crossed, solid material should be used, at least on top.

When roads are much used in heavy

teaming, their importance will afford macadamizing.—*Ex.*

IMPROVE YOUR WAYS.

Dr. Peter Collier of the New York Experimental Station in a recent address to farmers said in regard to the matter of improvement of public roads:

"It seems to me that it should be for the future 'the pet scheme' of every man, and of every woman and child also, until some action shall be taken looking to their permanent improvement. Within a week I had the pleasure of riding over a stretch of macadamized road nine miles in length which within two years has been laid in one of the New England States, and I could not but think that such a road, like a thing of beauty, was a joy forever. Consider for a moment the enormous tax which our roads involve, without considering even the millions upon millions of dollars which during the past half century have been expended upon our roads without at present any evidence of improvement in their condition; consider the wear and tear of horses, harness and vehicles which the condition of our roads for months in the year involves; consider the loss of time which also is money, and the wear and tear upon one's patience, for I doubt whether grace has been given to any sufficient to sustain him for a ten-mile drive over any of our roads during several months of the year."

Agricultural.

PEANUTS.

There is very little danger of the cultivation of peanuts being over-done while there is such an extensive demand for peanut oil, says the American Agriculturist. It is stated on good authority that about six million dollars worth of

peanuts are used annually in Marseilles, France, by the manufactures of fancy soaps. A bushel of peanuts, subjected to hydraulic pressure, yields a gallon of oil.

The oil is also excellent for lubricating purposes; but we have scarcely begun to know what uses of this oil here, for, of the three million bushels raised in the Southern States, nearly all are used for food alone, and there is very little surplus for other purposes.—*Ex.*

IMPROVING THE SOIL.

There are three methods by which the soil may be improved. These are drainage, cultivation and manuring. Drainage not only rids the soil of surplus moisture, but also places it in condition to be worked earlier, puts it in a better tilth and adds to its fertility by straining the water as it passes along the ground.

Many fail to appreciate the advantages of thorough cultivation as a means of improving the soil. A good ploughing in the fall leaves the land in a better condition to be benefited by thawing and freezing. It throws apart the hardest clods and renders available the plant food that they contain. Preparation and cultivation in the spring aids to make plant food available. The finer the condition of the soil the larger will be the supply of available plant food. This is one of the chief benefits of thoroughly preparing the soil for the reception of the seed and then of keeping it in a good condition by cultivating during growth.

The conditions of the soil that are most favorable for plant growth are also best for its improvement, and thorough cultivation enables us to maintain these conditions more perfectly.

Manuring adds to the supply of plant food in the soil, but in order to be of the most benefit to the growing plants it is necessary that the fertilizers should

be in available condition. The action of some materials is to so act upon the soil as to increase the amount of available plant food while others add to the amount of soil. This fact must be considered in manuring. All three are dependent upon each other in securing the best results, and a failure to supply any one of them will effect the general results, while the more thoroughly each is given the greater will be the improvement.—*Prairie Farmer.*

EMERSON ON FARMING.

The prince of thinkers, Ralph Waldo Emerson, who had the wonderful ability of glorifying any subject he touched with his pen, said some pithy and beautiful things in an essay on farming says the *Indiana Farmer*. It seems strange that so much can be said in praise of the prosy old business. Let us quote a few of his sentences:

"The glory of the farmer is that in the division of labor, it is his in great part to create. All trade rests at least on his primitive activity.

"The farmer times himself to nature, and acquires that lifelong patience which belongs to him. Slow, patient man, his rule is, that the earth shall clothe and feed him; and he must wait for his crop to grow. His entertainment, his liberties, and his spending must be on a farmer's scale, and not a merchant's. It were as false for farmers to use a massy expense' as for States to use a minute economy.

"The city is always recruited from the country. The men in cities who are the centers of energy, the driving wheels of trade, politics, or practical arts, and the women of beauty and genius are the children or grandchildren of farmers, and are spending the energies which their father's hardly, silent life accumulated in frosty furrows, in poverty, necessity, and darkness.

"Who are the farmers' servants? Not the Irish, nor the coolies, but geology and chemistry, the quarry of the air, and water of the brook, the lightning of the cloud, the casting of the worm, the plough of the frost.

"Nature like a cautious testator, ties up her estate so as not to bestow it all on one generation, but has a forelooking tenderness and equal regard to the next and the next, and the fourth and the fortieth age.

"See what the farmer accomplishes by a cart load of tiles: he alters the climate by letting off water which kept the land cold through constant evaporation, and allows the warm rain to bring down into the roots the temperature of the air and of surface soil; and he deepens the soil, since the discharge of this standing water allows the roots of his plant to penetrate below the surface of his subsoil, and accelerates the ripening of his crops."

WHAT A HORSE WOULD SAY IF HE COULD SPEAK ENGLISH.

Don't hitch me to an iron post or railing when the mercury is below freezing. I need the skin on my tongue.

Don't leave me hitched in my stall at night with a big cob right where I must lie down. I am tied and can't select a smooth place.

Don't compel me to eat more salt than I want by mixing it with my oats. I know better than any other animal how much I need.

Don't think because I go free under the whip I don't get tired. You would move up if under the whip.

Don't think because I am a horse that iron weeds and briars won't hurt my hay.

Don't whip me when I get frightened along the road, or I will expect it next time and maybe make trouble.

Don't trot me up hill, for I have to

carry you and the buggy and myself too. Try it yourself some time. Run up hill with a big load.

Don't keep my stable very dark' for when I go out into the light my eyes are injured, especially if snow be on the ground.

Don't say whoa, unless you mean it. Teach me to stop at the word. It may check me if the lines break and save a run-away and smash-up.

Don't make me drink ice cold water. nor put a frosty bit in my mouth. Warm the bit by holding it a half minnte against my body.

Don't forget to file my teeth when they get jagged and I cannot chew my food. When I get lean it is a sign my teeth want filing.

Don't ask me to "back" with blinds on. I am afraid to.

Don't run me down a steep hill, for if anything should give way I might break your neck.

Don't put on my blind-bridle so that it irritates my eye, or so leave my forelock that it will be in my eyes.

Don't be so careless of my harness as to find a great sore on me before you attend to it.

Don't lend me to some blockhead that has less sense than I have.

Don't forget the old book that is a friend of all the oppressed, that says: "A merciful man is merciful to his beast."—*Farm Journal*,

HOW TO THINK.

It is very profitable to think before you begin a job of work. Something in this style will do. What am I going to do? What am I going to do it for? What am I going to do it with? Is the tool I intend to use the best one for the work? Is it in the best order? Where am I going to begin? Will I get it done in time to be of any use? Will it lead

to profit? All this must follow, if the job is planting a crop. Some other questions are like these: What is the best kind of seed? Where can I get it? Can I depend on that man's word about it? Do I know good seed when I see it? It should not take more than two minutes to answer all these questions, but each one is vital.—*Telegraph*.

HOW HE SUCCEEDED.

BY MISS FARMER.

Harry Stafford, a little paler than usual, came home to his supper.

"Well, mother," he said, "I saw Dr. Wells to-day and he advised me to give up bookkeeping for a while and go into the country. But that seems out of the question, for I would certainly lose my position.

His widowed mother whose calm, serene countenance indicated a heart and mind full of faith and peace, replied:

"My son, life is nothing without health. Seek that before riches. It is now the first of June. How would it be for you to go to the country and find some place where you can do a little work for your board. In this way you will feel justified in enjoying open air and rustic scenery for a greater period of time, while the exercise will be beneficial to you in building up your weak muscles and in allowing no time to hang heavily on your hands."

This commonplace and unromantic statement seemed to strike Harry favorably for he replied:

"That is quite an idea, mother, and I believe I shall have to try it. You know I have thought of old Uncle George on his farm, but I was there once and that was enough for me. I wonder whether he wouldn't have had a more respectable home if he had ever been married. But there he is, a shocking specimen of old

bachelorhood without kin of any description to plan or labor for, but reigning supremely over every cat, dog, cow and horse over which he claims proprietorship."

His mother smiled at his remarks and tea now being ready, they left off further discussion of the subject. The next day Harry resigned his position in the Watertown Bank where he had been employed at a salary of a thousand dollars a year, and returning home surprised his mother by telling her he wanted his oldest clothes to put into the grip, as he had concluded to follow her advice.

So, early on Wednesday, June 3rd, he took the train to Berryville, a small station twenty-five miles out of town and from that place began his excursion on foot. How he did wish now that he knew some one in the country, or that he could have had a letter of introduction to some honest farmer. But all of his relatives, friends and acquaintances lived in Watertown or other cities, with the exception of crabbed old Uncle George.

Harry walked on quite leisurely at first, seeking the shady side-path, as the warm rays of the sun and the dusty road were quite a contrast to the pavements shaded by the tall buildings, to which he was accustomed. However, the fresh breezes fanned his perspiring face and his walk became more full of life. The first house he saw reminded him of his Uncle George's, so he passed it by. The next had the front yard ornamented with a drove of grunting pigs and he increased his speed by that place. The next house appeared to be vacant, and as he walked by he saw away down the road a carriage and pair of Cleveland Bays tied in front of a good looking house. As he drew nearer and had a good view of the commodious, well painted barns and the nicely trimmed

trees and lawn, he concluded—"I think I would like this place, but perhaps they will not take a fancy to me." He turned in at the gate and at the door met one of the sons to whom he raised his hat and said:

"Excuse me; I am Harry Stafford of 69 Bay Street, Watertown, and have come out into the country to look for employment. You may think it strange, but my physician prescribed country air for me and so I left my occupation as bookkeeper and here I am."

He stopped abruptly, looking all the while into the young farmers face which showed that evidently he was somewhat amused as well as surprised at the undisguised statement made by the young man. He kindly invited the stranger in to see his father.

The family were about to partake of their noon meal and Harry gladly accepted a place at the table. Here he took a further mental survey of the family and their surroundings. The father was a large, stalwart German with very dark eyes and complexion; his wife much the same; one son very large and broad-shouldered, the other son of medium size, while the daughter was short, fair and fat, making quite a striking contrast to the other dark complexioned members of the family.

Harry's walk had given him an unusual appetite and the ham, potatoes, cabbage and rhubarb pie disappeared rapidly from his plate. After conversing freely with the family, who proved to be intelligent and well informed, Harry again made his application for the position of hired man. He said it was not the wages particularly he was in search of, but the fresh air and exercise, with board in the bargain. It was finally settled that he was to have fifteen dollars for the month of June and if, at the end of that time, there was mutual satis-

faction, he should receive fifteen dollars each succeeding month to October first.

So Harry's first actual experience on a farm began. Having an observing mind and an active temperament, he soon learned much of the art of farming. His leisure hours he spent in reading papers and books on agriculture, or in silent meditation of what he saw and read daily. He enjoyed the teaming work and the tending of the horses and colts, but it must be confessed that when ordered to remove to the field the manures from the abode of the cattle and swine, he grew somewhat homesick. He made up his mind, however, that it did not injure him in any way, and so persevered, whistling or humming a lively tune of the olden time. He smiled to himself sometimes as he imagined what his city friends would think or say to see him so employed. But, as time advanced, his face grew more ruddy and plump, and his step became firmer. He would scarcely be recognized as the pale young man with a rather languid air who got off the train some time before at Berryville.

As Harry's services were needed to assist in the fall teaming, his time was extended to November first. Now he frequently drove to Watertown with loads and on one of these occasions his mother came out with him for a few days' visit.

It was a delightful week in autumn and the kind and thoughtful but not intrusive ways of the family pleased his mother very much and she expressed her gratitude for all their kindness to both herself and son.

Harry seemed very happy and in better spirits than usual as he related his various experiences of the summer; how he had assisted in the miscellaneous work of the farm, even helping a few days with the ditching and laying tile. It was evident that the utmost confidence

existed between him and his employer. November came and Mrs. Stafford and her son having said their adieus to their friends on the farm, were once more seated around their own fireplace. They were just enjoying a little lunch of hot chocolate and graham crackers when a messenger came bearing a telegram which contained very sad news.

(Concluded in next number.)

THE POWER OF HOME LIFE.

A Striking Contrast.

It was a beautiful summer morning, the air was soft and balmy; we were driving briskly along the public highway, when we neared a farm house that was browned with age, and withal wore a dilapidated appearance, having here and there about the grounds an old stub of a tree—moss-grown and scraggy. The yard gate was broken down and the out-buildings forbidding, with no flowers or rustic seats. But we see a bareheaded, barefooted, ragged, dirty-faced boy, running out at the door as if running for his life; at a bound he turns the corner of the house, the mother follows in close pursuit to the door, hollowing at the top of her voice, "You come back here you dirty-faced brat and I'll beat the life out of you"—her hair hanging disorderly about her face—dark lines gave the appearance of hardness to her features, her dress was ill-fitting and torn.

We drove on, pondering in our mind the possibilities of life, the influence of environments, etc.

A mile further on, to our right, lies a beautiful little farm, the fencing is in neat repair, the waving grain is golden almost to the harvest sickle, the out-buildings are painted and orderly; nestled in the background of a beautiful grove is a neat little farm house. A winding pathway leads up to the verandah. There are flowers and shrubs, and

climbing vines. There comes to me upon the soft breath of air the sound of sweet music floating out through the open windows, and through the trees. It is the sound of a piano and singing. A boy 13 or 14 years of age, with ruddy countenance, is standing near the step as if lingering to catch the last words of the song accompanying the music. He is clad in his working clothes, with hat in hand. We did not see the mother, but her handiwork we saw and admired.

Tightening the rein of our horse we quickened our pace and passed on. The two pictures were before us, and the possibilities.

Almost two decades of years have gone by, the boy of the latter home is now the owner of a splendid farm with a beautiful farm house and pleasant surroundings, near a railway station on the Lake Erie & Western Railroad. He is honored by his neighbors, and a blessing to the circle in which he moves.

The lad of the first home referred to has also grown to manhood. Shall we tell you—must we tell you—that he looks out upon the sun-kissed earth, through the grates of a prison. They breathed alike, pure air, basked in the same sunshine, attended the same school, played together in their boyhood upon the same playground, then why the difference? Did their home-life have much to do with the fruitage of their lives? If the home-life of each gave the trend that guided to the end, then how important are the surroundings and guidings of childhood.

Look upon *this* picture and then upon *that*.

A DRAINAGE ENTERPRISE.

The Lake Fork Special Drainage District, Logan County, Ill., have advertised to let contract, March 17, 1891, for the removal of two hundred and seventy-five thousand cubic yards of earth. The open drain will be about 12 miles long. H. C. Girtman, D. B. Landis, A. H. Lucas, commissioners, Mt. Pulaski, Ill.

Tilemaking.



THE IOWA CONVENTION.

The ninth annual meeting of the Iowa Tile, Brick and Drainage Association, held at Des Moines February 4th and 5th, was well attended. The papers and discussions were full of interest.

A goodly number of the old "standbys" were there, but a few, however, that have always attended were missing from the circle. We do not know why. We know that some of them are still actively engaged in the manufacture of tile.

In a fatherly way we wish to admonish them to be present at the future meetings of the Association.

THE OHIO CONVENTION.

The Ohio Tile, Brick and Drainage Convention, held February 25th and 26th, was a very successful convention, well attended, and full of interest from the beginning to the end.

So much of the proceedings as we may judge of interest to our readers will appear in the April number of the JOURNAL.

The officers elect for the ensuing year are: President, J. W. Everal, Westerville,

O.; Vice-President, B. W. Blair, Cincinnati, O.; Secretary, W. D. Richardson, North Baltimore, O.; Treasurer, S. E. Hagy, Etna, O.

Adjourned to meet the second Wednesday in February, 1892.

IOWA TILE, BRICK AND DRAINAGE ASSOCIATION.

The Association met in the State House, in the City of Des Moines, February 4th, at 2 o'clock p. m. The reports from members showed an increased activity in the tile business, and a very lively interest among brick manufacturers.

The president, J. V. Boling, delivered the annual address, in which he congratulated the Convention for the advance achieved in the past year, and spoke encouragingly of the future.

A spirited discussion was had as to the best quality of paving brick, some of the members insisting that pavers should be vitrified, others expressing a preference for only partial vitrification.

It was generally agreed that the standard of excellence should be placed high. By so doing the merit of brick pavement will be fully established. It was conceded that many brick have been used in the past two years that were not as good as they should have been, notwithstanding their want of hardness they are standing the wear better than was expected.

The sizes used in building were recommended for pavers, then all rejected pavers can be used for building, and in any future repairs that may be needed there will be no difficulty in securing brick of the right size.

Sand was recommended in preference to hard foundations. That the street should be brought to grade and rolled, then covered with four inches of sand, on which should be laid the first course

of hard brick, side down, covering with two inches of sand, on which set upper course of hard pavers edgewise, breaking joints, the latter course to be set crosswise of the travel. The top course should be lightly covered with sand.

Some of the members insisted that the lower course of brick should be hard enough for top pavers, for the reason that in taking up the pavement to lay gas and water pipe—they would mix the brick to the detriment of the pavement if the lower course is not hard enough for top pavers.

Others mentioned that good hard brick, such as are used for paving sidewalks is in all respects sufficient, being placed as they are between two cushions of sand.

The following are the names of officers elect for the ensuing year: President, J. V. Boling, of Stanwood; vice-president, I. P. Smith, of North English; secretary, C. L. Smith, of North English; assistant secretary, G. S. Chambers, of Des Moines; treasurer, William Kettell, of Tipton.

A VISIT TO THE BRICK WORKS.

The Des Moines Brick Manufacturing Co., of Des Moines, Ia., extended a pressing invitation to the Iowa Tile and Brick Convention to visit their works, situated two miles west of the city. They arranged for a special train on the Wabash R. R. which set a parlor car and engine on the side track at the depot for the accommodation of the Association. Some forty members and others filled the car, and were soon on their way, arriving at the works about 2 o'clock p. m. Very many of the visitors were agreeably surprised at the extent of the works.

The cash capital of the company is \$100,000. They have erected a large plant situated on Coon river between the bluff and two lines of railroads that furnish competition in the shipping trade.

These works have been erected for the

especial purpose of manufacturing paving brick.

J. W. Penfield & Son have put in a full line of their heavy machinery, guaranteed to turn out 80,000 pavers per day.

They have also put in a Penfield dryer, having a capacity of 100,000 brick.

They have erected, completed, and have in use, four Eudaly kilns each having a capacity of 250,000 brick, and they are building two more of the same kind.

There are probably a million or more of paving brick upon the yards, and we have it to say, that they are the best in all respects of any large output of pavers that we have ever examined.

Mr. S. A. Robertson, the president of the company, informs us that in burning they have not a loss of more than three per cent. We examined a kiln that was being emptied and the uniformity of the burn certainly could not be excelled.

The preparation of the clays and the uniform methods of pressing the brick together with the quality of the clay has no doubt much to do with the success attained; but the brick as they come from the kiln speak very satisfactorily of the work all along the line.

The bank of clay is composed of different stratas, varying very much in their appearance and analyses, but mixed together as they are, so thoroughly, gives excellent results. The bank extends from top of the bluff (which is probably fifty feet in height) down to the possible depth of 100 feet, and will be sufficient for the use of this and succeeding companies for the next century.

On returning the visitors unanimously extended to Col. Robertson and other members of the company, and the Wabash Railroad, a vote of thanks for the favors and attention shown them. One and all said, "We are glad that we accepted the invitation, and have enjoyed the trip very much."

A Brick Poem.

*BY D. O. LOY.

In a beautiful garden on Eden's fair plain,

Our old Mother Eve began to raise Cain.

Now if we believe what historians say,

Cain was much harder than vitrified clay.

A patent brick clamp advertise if you will

But Cain was the man who invented the kill.

For brick kilns in Eden there were no demands,

So Cain was advised to seek other lands.

In that olden time when the world was new,

They never used brick for a cellar or fine.

No well brick were used at the time Adam fell

For long ages since Jacob dug the first well.

No cisterns were made in that garden so new

For Adam and Eve had no washing to do.

The first brick made at Babel was used

Where brickmakers language was mixed and confused.

Though that tower was a failure, the bricks which

were made

By those ancient people established our trade.

From that day till this in each civilized land

For brick there has been an increasing demand.

When Jacob's grandchildren in Egypt were kids

They were moulding the brick for those huge

pyramids.

And our minds often wander back to that day

When those slaves made brick from stubble and clay

And we fancy we hear old King Pharaoh ask

Those Hebrew slaves to increase their task.

And we fancy they moistened the clay with their

tears

While moulding brick in those ancient years.

But we know that those slaves whom that king

possessed

Have long since gone to their home of rest.

And the king who ruled with pomp and pride;

That king and his children have long since died.

Of his royal palace, his crown or throne

Not one relic of these, to-day is known.

That king and his children are mummies to-day,

Yet their language we read on the bricks made of

clay.

The Egyptian kingdom; its rise and fall,

Hieroglyphics on bricks has told it all.

Before Moses from Egypt went out on a strike;

He invented a kill claimed by Castle and Pike.

And the Stewart brick kiln is laid in the shade,

For the Hebrews burned bricks before they were

made.

Near an ancient city deep under the ground,

A kiln like Eudaly's was recently found.

Articles on brickmaking in the JOURNAL appears

Which have been composed over three thousand

years.

Like those Hebrew slaves we will soon pass away,

But the bricks we have made will never decay.

Then I'll write on each brick in the mould that I

cast.

A message of love that forever will last.

A poem on brick at once I'll commence,

To be read by brickmakers ten thousand years

hence.

Were I choosing a brick from the new or the old,

I would not select a brick made of pure gold.

A brick made of pure gold, time would surely de-

stroy,

While a brick would last always if made of a Loy.

If you doubt what I say I'm ready for that,

For I always carry a brick in my hat.

*Read before the Illinois Brick and Tilemakers Convention, January 14th, 1891.

settles to the bottom of the open ditches, when the water does not have a rapid flow, and makes a very tight bottom, so that the water in the open ditches does not pass down readily to the underdrains. The storm water ditches should be so graded as to allow the storm water to pass off without hinderance except that the fall may be slight, and the flow be slow. The underdrains cut off the passage of the water in the soil and subsoil under the roadbed and provides an outlet for spring or seep water that might otherwise arise under the roadbed, carrying it out at a depth that will not injure the roadbed.

We are glad to have Mr. Maynard recommend the underdrainage of highways. We believe that it will be found to be the master stroke in the future improvement of our highways. So far this method of improvement is proving very satisfactory indeed.

A WORD TO THOSE WHO WRITE US.

We wish to impress our patrons who write us with the need of giving their address in full and very plain. Good business men are often careless in their correspondence and forget to add the State, or leave some important part out of their address. It is not uncommon to spell the post-office incorrectly, to write their own name so illegibly that it is guess work to determine what it is. We give one instance: A. B. writes us from West Groton—no State. Groton is fairly written "Grotin"—the stamp on the envelope is not plain enough to be read; we turn to the P. O. Guide and look in the general list for "West Grotin," but we fail to find it; we do find West Groton, Mass., and West Groton, N. Y. A. B. wants "Elliott's Farm Drainage" by mail—has sent the stamps. We guess that he is more likely to be in New

York, and mail the book and take the risk in order to avoid the delay.

Occasionally we get a remittance with no address, that it is possible to make out, we enter the date that it is received and the amount and wait until somebody writes us that they made a remittance corresponding with the date entered, it may be months before we hear from the right party, but it is the best we can do. Occasionally we get a remittance of money inclosed in an envelope without the mark of a pen. The post-office may be stamped on the outside plain enough to enable us to write a postal inquiry and ascertain who sent it, and it may not. There are hours spent in the office by clerks trying to avoid the making of mistakes in such cases.

We note another very common omission made by those changing their address from one post-office to another, by giving the name of the post-office only—"change my address to Owl Creek, Pa."—but we do not remember the former office, and can't make the change with proper credit until we ascertain, so we must write a postal note to C. D., Owl Creek, Pa., to get the information. Such mistakes are annoying to all parties concerned. Be careful. Write plainly, the name, post-office, County and State, and you will have no trouble with this office.

PUBLICATIONS.

John A. Salzer's Seed Catalogue comes to us as fresh as a bed of pansies. We are assured that this is a very reliable seed house. The important point in getting seeds is the assurance that the seeds are fresh and pure. Mr. Salzer has made for himself a good reputation in this respect. For Catalogue, address John A. Salzer, La Crosse, Wis.

Miscellaneous.

Just Do Your Best.

The sign is bad when folks commence
A findin' fault with Providence,
And balkin' cause the earth don't shake
At every prancin' step they take.
No man is great till he can see
How less than little he would be
Ef stripped to self, and stark and bare,
He hung his sign out anywhere.

My doctern is to lay aside
Contentions and be satisfied;
Just do your best, and praise or blame
That follers that counts, just the same
I've allus noticed great success
Is mixed with trouble more or less.
And it's the man who does the best
That gets more kicks than all the rest.

JAMES WHITCOMB RILEY.

HOW HIS MOTHER "MANAGED."

"You see how how it is, my dear," he said, taking her soft hand which had never done very hard work, and patting it reassuringly. "I'm poor—only a thousand a year—and we shall have a struggle to get along at first—"

"I don't mind that in the least," she interrupted stoutly, rubbing her cheek softly against his hand.

"And," he paused, graciously having allowed her interruption, "we shall have to come down to strict economy. But if you can only manage as my mother does we shall pull through nicely."

"And how does your mother manage, dear?" she asked smiling—but very happily—at the notion of the mother-in-law cropping out all already.

"I don't know," replied the lover, radiantly, "but she always manages to have everything neat and cheerful and something delicious to eat—and she does it all herself, you know! So that we always get along beautifully and make both ends meet, and father and I still have plenty of spending money. You see when a woman is always hiring her laundry work done and her gowns and

bonnets made, and her scrubbing and stove-blackening done, and all that sort of thing—why it just walks into a man's income and takes his breath away."

The young woman looked for a moment as if her breath was also inclined for a vacation, but she wisely concealed her dismay, and, being one of the stout-hearted of the earth, she determined to learn a few things of John's mother, and so went to her for a long visit the next day. Upon the termination of this visit one fine morning John received, to his blank amazement, a little package containing his engagement ring, accompanied by the following letter:

"I have learned how your mother 'manages,' and I am going to explain it to you, since you have confessed you didn't know. I find that she is a wife, a mother, a housekeeper, a business manager, a hired girl, a laundress, a seamstress, a mender and patcher, a dairy maid, a cook, a nurse, a kitchen gardener and a general slave for a family of five. She works from five in the morning until ten at night, and I almost wept when I kissed her hand, it was so hard and wrinkled, and corded and unkind. When I saw her polishing the stoves, carrying big buckets of water, and great armfuls of wood, often splitting the latter, I asked her why John didn't do such things for her. 'John!' she repeated 'John!'—and she sat down with a perfectly dazed look, as if I asked why the angels didn't come down and scrub for her. 'Why—John!'—she said in a trembling, bewildered way—'he works in the office from 9 until 4 o'clock, you know, and when he comes home he is very tired, or else—or else—he goes down town.'

"Now I have become strongly imbued with the conviction that I do not care to be so good a 'manager' as your mother. If the wife must do all sorts of drudgery,

so must the husband. If she must cook, he must carry the wood; if she must scrub, he must carry the water; if she must make butter, he must also milk the cows. You have allowed your mother to do everything, and all that you have to say of her is that she is an 'excellent manager.' I do not care for such a reputation unless my husband earned the name also; and judging from your lack of consideration for your mother, I am quite sure that you are not the man I thought you were, nor one whom I should care to marry. As the son is the husband is, is a safe and happy rule to follow."

So the letter closed, and John pondered, and he is pondering yet.—*Ella Higgins, in Pittsburg Leader.*

WHAT MAKES A BOY POPULAR?

What makes a boy popular? Manliness, says Hezekiah Butterworth in *The Ladies Home Journal*. During the war, how schools and colleges followed popular boys! These young leaders were the many boys whose hearts could be trusted.

The boy who respects his mother has *leadership* in him. The boy who is careful of his sister, is a knight. The boy who will never violate his word, and who will pledge his honor to his own heart and change not, will have the confidence of his fellows. The boy who defends the weak will one day become a hero among the strong. The boy who will never hurt the feelings of any one will one day find himself in the atmosphere of universal sympathy. "I know not," once said the great Governor Andrew, "what record of sin may await me in another world; but this I do know: I *never yet* despised a man because he was poor, because he was ignorant, or because he was black."

Shall I tell you how to become a pop-

ular boy? I will. Be too manly and unselfish to seek to be popular; be the soul of honor, and love others better than yourself, and people will give you their hearts and delight to make *you* happy.

That is what makes a boy popular.

COMFORTABLE SORT OF A WOMAN.

"It comforts me," said the bent little old man as he spoke tenderly of his dead wife, "It comforts me to know that Sally would allus lie down every afternoon an' sleep a bit. Some folks tho, 'twas no wonder we didn't get rich faster, but she suited me jest as she was. Sally was a comfortable sort of a woman to have around, never frettin' at a feller or faultin' him when things didn't go right. When feelin' troubled she'd often say, 'Father, I believe I'll lie down for a few minuits,' then back she'd come as spry and chipper as a canary bird. Sally didn't drive and scold, but she wasn't lazy, an' she brought up the youngsters to do their part. I don't see that drivin' women get on any mite better than she did. It does comfort me to know that Sally would take her rest."

A good many women who are overworking to do things which are not half as necessary as a live mother is, might well take a lesson from this "comfortable sort of a woman" and "lie down for a few minutes" and take their rest. And if mothers would bring up "the youngsters to do their part," instead of working themselves to death while sons are lying in bed and daughters are playing the lady, we might have more healthy, cheery grandmothers than we now have, and their children, when arriving at the years of discretion, would be thanking God for mothers who taught them to work, instead of mourning over the graves of mothers who worked themselves to death instead of laying a part of the burden on the shoulders of thoughtless children who were much better able to bear it.—*Grange Homes.*

SENSE ABOUT SHINGLING.

It is almost always the custom to lay shingles tight together, but no practice could be more erroneous. Why dam up the water in 700 or 800 cracks to every 1,000 shingles where it necessarily soaks under them? Every crack must be full when it rains. Sawed shingles lie so tight that water does not dry out, and they last but a short time. They should be laid at least three-fourths of an inch apart, so that the water can run freely down the roof. The joints need not be broken over more than one inch for the water will not soak under them at all. I shingled a barn about fifteen years ago, laying the shingles in the usual way and they are so rotted now I am obliged to shingle it again this spring. Two years later I shingled another with the same kind of half-inch boards, this time laying them half an inch apart and these lie as smooth and are as sound as when laid. Three years ago I built a house and laid the shingles three-fourths of an inch apart. There are two eave spouts pouring the water from other roofs onto the shingles of the ell, but no dampness has ever been on the roof boards. The roof boards should be tight leaving no hole for the snow to blow in. I matched the boards on one side of the upright part, but no snow has blown in where they are not matched. At first people in the vicinity were afraid to shingle in this way, but the experiment has proved a success, and now many are practicing it and finding it perfectly satisfactory. I think poor quality of shingles would last three times as long used in this way.—*Farmer and Home.*

The Ladies Home Journal, 435 Arch Street, Philadelphia—we wish to commend this leading journal to the patronage of our readers. It is the choice of our family. Send for sample copy.

THE HORSESHOER.

"Never let your blacksmith scorch, scar and burn the hoof to fit his shoe, or in repeated observations to see if the shoe will fit. It is not necessary to touch the foot with a hot shoe." Owners of horses should attend to the shoeing themselves and see that the feet are not injured. Continuing the writer well says: "I have seen a smith shoe a horse by fitting one shoe at a time, and when he had done the horse has four different shaped feet. Have the shoes all fitted before nailing. Make the forward shoes just alike in shape, weight and width between the heel calks, then put them on. Then shoe the hind feet in the same manner, always remembering that steel shoes are the lightest, best and in the end cheapest.—*Ex.*

THE NEW WEBSTER

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G. & C. MERRIAM & CO., Publishers,
Springfield, Mass., U. S. A.

Caution!—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, a edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

THE AGRICULTURAL CLUB.

A Publication to Increase the Interest in Farm Drainage,
Now in its Fifth Year.

A number of manufacturers of Drain Tile have used this publication to build up their trade by increasing the interest in farm drainage.

Clubs ranging from 10 to 530 subscribers have already been received for 1891.

Those who have given the matter a fair trial are convinced that the investment of a little money in sending the AGRICULTURAL CLUB free to those who purchase tile or who ought to purchase tile to drain their land pays—and pays well.

The need of getting the importance of underdrainage directly before those who need to use tile, and keep it before them in a way they *cannot forget it*, and in a way that is likely to influence them to double or more than double their work in this direction, and to awaken an interest among those who have done little or nothing in the way of draining their land, there is not a more effective way to do this than to send them monthly

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TERMS OF SUBSCRIPTION:

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That the AGRICULTURAL CLUB is made readable and interesting to farmers and their households, and others.

That it comes fresh and crisp every month to be read and thought over.

That it treats of Why and How to Drain.

That it contains nothing about making tile.

That it is printed on good paper with plain type.

That in subscribing for 100 or more copies that you may remit half the money for the year, and the remaining half at the end of six months.

That we will not enter the names of any subscribers for a less time than one year.

Remit to us in Postoffice Orders, Registered Letters, Bank Drafts or Express Orders at our risk. Address:

J. J. W. BILLINGSLEY,

Indianapolis, Ind.

A QUICK AND SATISFACTORY BURN.

Stewart Brothers,

Mt. Victory, Ohio.

GENTS:—I have just completed a Tile Kiln of your patent, and, having a kiln of dry tile in my sheds, I put them in and burned them. I started a fire on Friday at 2 o'clock p. m. and fired slowly until 8 p. m., then closed the doors and went to bed. Next morning at 5 o'clock I fired up and slowly raised the heat until about 2:30 p. m., Saturday, when I filled the fire boxes full and kept it raging until 1 a. m. Sunday morning, when I quit firing, making 26 hours firing. Taking in consideration our new kiln and my inexperience with the kiln, I consider that as a remarkable burn. We emptied the kiln on Monday (it cooled in less than half the time required in our old kiln) and I found it the best burned kiln of tile that I ever burned.

If this statement will do you any good use it as you see proper.

Wishing you success, I remain,

Yours truly,

R. S. MILLER.

Tilman, Ind., Feb. 25, 1891.

A Victory for the Wagner Vestibule.

The Wagner Palace Car Company, operating sleeping cars over the BIG FOUR ROUTE, has gained a signal victory in its controversy with the Pullman Company. By the decision just rendered by Judges Gresham and Blodgett in the United States Circuit Court at Chicago, the motion made by the Pullman Company to enjoin the Wagner Company from the use of the "Vestibule" is denied and the Wagner Company is sustained in every point it has made in the contest. This decision practically disposes of the litigation and leaves the Wagner Company a clear field in which to demonstrate the superiority of its perfected Vestibule, which is now in use on all express trains of the BIG FOUR ROUTE making the trains practically solid from end to end, an advantage which will be readily appreciated by the traveling public.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.

GEO. L. PEARCE, Guineys, Va.

FOR SALE.

One Junior Westinghouse Engine, 15 h. p. Has been used for six weeks running a fan. For particulars and price, address J. W. PENFIELD & SON, ti. Willoughby, Ohio.

FOR SALE OR TRADE.

One Terre Haute Tile Machine, new.

One Penfield Plunge, steampower.

One Eureka Mill.

These machines can be bought very low. Address J. M. HEDGES, Terre Haute, Ind.

WANTED.

Second-hand steampower Tile Mill in good repair. Must be run with thirty h.p. engine.

A. BOYD,
1 t p. Montpelier, Ind.

FOR SALE.

One 14 h.p. engine, 20 h.p. boiler and one Penfield Tile Machine No. 7 and Clay Crusher in good condition. For sale at a bargain. For particulars address RUPRIGHT BROS.,
1 t p. Van Wert, Ohio.

FOR SALE.

Two New Bremen Tile Machines, one of which has a screen; is a 2 h.p. Size of dies, 2 to 8 in. The other is a 8 h.p.; size of dies from 2 to 12-inch. For prices, address F. M. GARDNER,
8 t p. New California, Ohio.

WANTED.

An experienced man to take charge of a tile works—new plant. Reference will be required. Address N. B. Co.,
2 t. Care Drainage Journal,

FOR SALE.

One Penfield Double Auger Mill, one Chandler & Taylor Double Plunger Mill. Clay crusher, barrows and large lot drying racks. Address

A. HINDS, JR.,
1 t p. 39 Dearborn St., Chicago, Ill.

FOR SALE.

Valuable Brick Plant for sale at Topeka, Kansas, with ten acres of finest clay for paving brick and fire-proofing in the West. Capacity 8,000,000 per year. Price low at \$30,000.00. Time easy. For further particulars address

KANSAS BRICK & TERRA COTTA CO.,
C. B. Williams, Gen'l Manager,
1 t. Care National Hotel, Topeka, Kan.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN.
Portland, Indiana.

WANTED SITUATION.

As foreman of brick or tile works, paving brick preferred. Have had experience and can give good reference. Address THOS. H. TRAINOR,
3 t p. 2000 N. Adams St., Peoria, Ill.

FOR SALE.

1 Ohio Brick and Tile Machine B Size; tile dies 2½ to 12 in. 1 Leach Table. 1 Revolving Table; has been used a part of one season and is in No. 1 condition and a bargain. Also 1 No. 6 Penfield Brick and Tile Machine, brickdie and table; tile dies 2½ to 8 in. and table is in good shape. Reason for selling—want to get a larger machine.

E BIGLOW,
22 t. West View, Ohio.

FOR SALE.

Tile Factory consisting of eleven acres of good land with excellent clay. One kiln; dry shed 220 ft. by 16 ft. One 18 b.p. engine. One Ohio Tile Machine, dies to 8 inches complete and in good running order. Also a good Wallace Clay Crusher and Elevator which have been used but one season, good as new. The Crusher and Elevator will be sold separately if desired and at a bargain for cash. This is a desirable plant. For prices and terms of payment, address
JESSE THOMPSON,
Selma, Ohio.

GREAT BARGAIN.

Tile Factory of J. F. Smith, deceased, located on R. R. switch, in rich section of the country at Gessie, Ind., will be sold at public sale at Perrysville, Ind, March 26th, 1891. Conveniently arranged. Large tubular boiler, heavy engine, first-class machinery, large sheds. Circular down-draft kiln—brick smokestack, abundant supply of water, and fine clay for tile. A rare chance for a bargain. For further information, address

Mrs. L. A. SMITH, Administratrix,
Perrysville, Ind.

Hulbert & Son, Inc., St. Louis, Mo.



Artistic Metal Workers.
Brass, Iron and Wire Office-work.
Railings, Crossings, Nettings, etc.
Everlasting Cemetery FENCES.
Shipped everywhere. Agents wanted.
Write for Catalogue and Estimate.



CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitrified Stone Sewer Pipe we
Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,

Cincinnati, O.

PATENTS

THOMAS P. SIMPSON, Washington, D. C. No attorney's fee until Patent obtained. Write for Inventor's Guide.



SALZER'S SEED POTATOES

There is genuine pleasure in cropping from 300 to 500 bushels Potatoes from each and every acre you plant. Now the way to do this is to get SALZER'S SEEDS.
60,000 BUSHELS SEED POTATOES CHEAP.

My WHITE BONANZA OATS took the American Agriculturist's prize—
\$500 in Gold—for biggest yielding Oats in America; cropping 184 bu. per acre.

I am the largest grower of
NORTHERN GROWN SEEDS, sufficient for family—postpaid—\$1.
In America, and make a great specialty of FARM SEEDS,
Grasses, Clover, Wheat, Corn, Oats, etc. My Farm Catalogue
is beautifully illustrated, contains several brilliant colored plates painted
from nature, elegant enough to adorn any parlor. **Send 5c. for same, or we will send Catalogue and grain samples upon receipt of 8c.**
JOHN A. SALZER, LA CROSSE, WISCONSIN.



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ROUTE**

The Shortest and most
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East, West,
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Solid Vestibule Trains,

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The **FINEST COACHES, PARLOR, RE-
CLINING CHAIR, CAFE and DIN-
ING CARS; WAGNER COM-
PARTMENT, BUFFET and
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ING CARS.**

Heated with Steam and Lighted
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**The FINEST TRAINS in AMERICA or
THE WORLD.**

Its SUPERB TRACK and UNRIVALED MACHINERY
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PERFECT SAFETY.

It is the only line which lands its passengers at
the GRAND CENTRAL DEPOT in the heart of the
great city of NEW YORK, which is an advantage of
NEARLY TWO HOURS in TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others,
passing through the famous CITY OF PULLMAN,
along the LAKE FRONT, and the far-famed MICH-
IGAN AVENUE BOULEVARD, in full view of the
finest RESIDENCES and PUBLIC BUILDINGS. In
fact, its Connections and TERMINAL FACILITIES at
all points are superior to those of any other line.

Its trains enter the Central Union Station, CIN-
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YORK; the Boston and Albany, BOSTON; the
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others in the vast territory it traverses between the
MISSISSIPPI RIVER on the west; the OHIO RIVER
on the south; the GREAT LAKES on the north,
and the principal SEA-BOARD CITIES in the east.

The Indianapolis Offices of this great line are
located at

**No. 1 East Washington Street,
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and the UNION STATION, where tickets can be pro-
cured to all parts of the UNITED STATES and
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OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

H. M. BRONSON,
Ass't Gen'l Passenger Agent,
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RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental
Designs, Paving Tile, etc.

BRICK MAKERS' SUPPLIES.

Tempering Wheels, Trucks, Moulds, Barrows, etc.
Send for circulars.

**C. W. RAYMOND & CO.,
DAYTON, OHIO.**

A \$5 Book For \$1.00. How To Build A House.



If you are thinking of building a house you ought to buy the new
book, Palliser's American Architecture, or every man a
complete builder, prepared by Palliser, Palliser & Co., the well
known architects.

There is not a Builder or any one intending to Build or otherwise
interested that can afford to be without it. It is a practical work and
everybody buys it. The best, cheapest and most popular work ever
issued on Building. Nearly four hundred drawings. A \$5 book in
size and style, but we have determined to make it meet the popular
demand, to suit the times, so that it can be easily reached by all.

This book contains 104 pages 11 x 14 inches in size, and consists of
large 9 x 12 plate pages giving plans, elevations, perspective views,
descriptions, owners' names, actual cost of construction, no guess
work, and instructions How to Build 70 Cottages, Villas,
Double Houses, Brick Block Houses, suitable for city suburbs, town
and country, houses for the farm and workmen's homes for all
sections of the country, and costing from \$300 to \$6,500; also Barns,
Stables, School House, Town Hall, Churches, and other public
buildings, together with specifications, form of contract, and a large
amount of information on the erection of buildings, selection of site,
employment of Architects. It is worth \$5.00 to any one, but I will
send it in paper cover by mail postpaid on receipt of \$1.00; bound in
cloth, \$2.00. Address all orders to J. S. OGILVIE, Publisher,
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Short Line to Kansas City and the West.

Lv Indianapolis	8.30 a.m.	11.00 p.m. (daily.)
Ar Decatur	2.45 p.m.	3.50 a.m.
Springfield	4.45 p.m.	6.00 a.m.
Jacksonville	6.10 p.m.	7.12 a.m.
Hannibal	9.35 p.m.	10.40 a.m.
Quincy	9.50 p.m.	10.45 a.m.
Keokuk	11.15 p.m.	11.35 a.m.
St Louis	6.45 p.m.	7.45 a.m.
Peoria	6.45 p.m.	9.15 a.m.
Kansas City	7.10 a.m.	6.15 p.m.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin, Bluffs and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK,
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LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.
Arrive in Chicago 2.30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily.....11:10 a. m.
Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.
Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday.....11:55 p. m.
Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily..... 9:55 a. m.
Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.
Arrive in Indianapolis 3:55 a. m.

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily

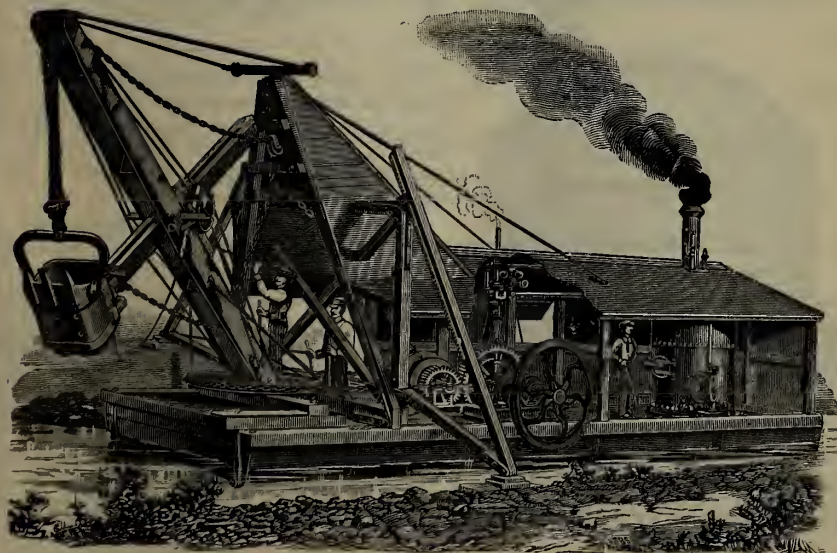
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I. D. BALDWIN, D. P. A., Indianapolis.

JAS. BARKER, G. P. A., Chicago.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



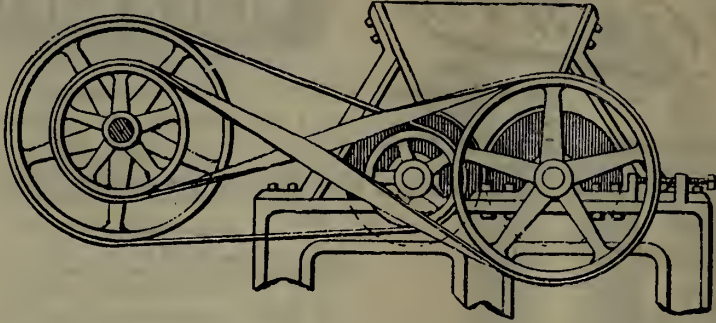
Manufactured by

MARION STEAM SHOVEL CO.,

MARION, OHIO.

THE Crusher and Disintegrator.

PATENT APPLIED FOR.



The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others. in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

BOX 246, AYLMEER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.

ERTEL'S VICTOR
SHIPPED ANYWHERE TO OPERATE
ON TRIAL AGAINST ALL OTHER
MAY PRESSES

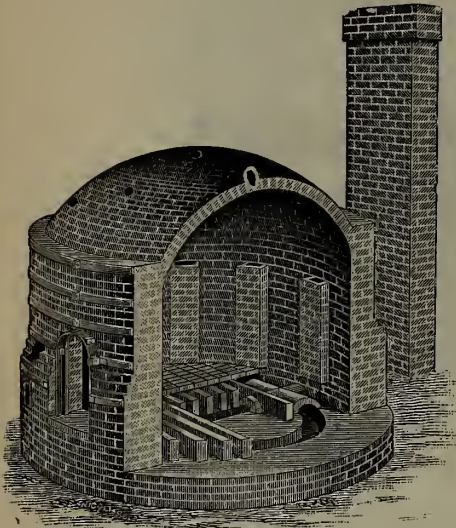
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PURCHASERS TO KEEP ONE
DOING MOST AND BEST WORK
MONEY

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WOOD AND PHOTO
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23 HUBBARD BLK Indianapolis Ind.

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT LEADS THE WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

÷New and Improved Brick and Tile Kiln÷

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tile makers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



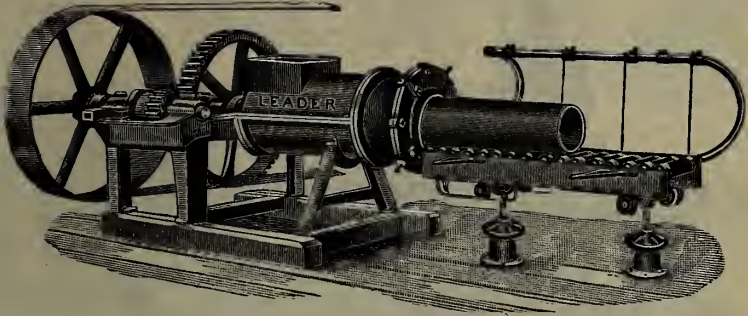
J. B. GRAWCOCK, Churubusco, Ind.

Brown-Frazier Manufacturing Co.,

PORTLAND, INDIANA,

—MANUFACTURERS OF—

Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,

Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR

**CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.**



SECTION OF CONVEYOR.

ELEVATORS

FOR TILE,
BRICK,

PACKAGES, ETC.

Roller & Detachable

CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

ADDRESS

The Jeffrey Manufacturing Co.,

112 East First Avenue,

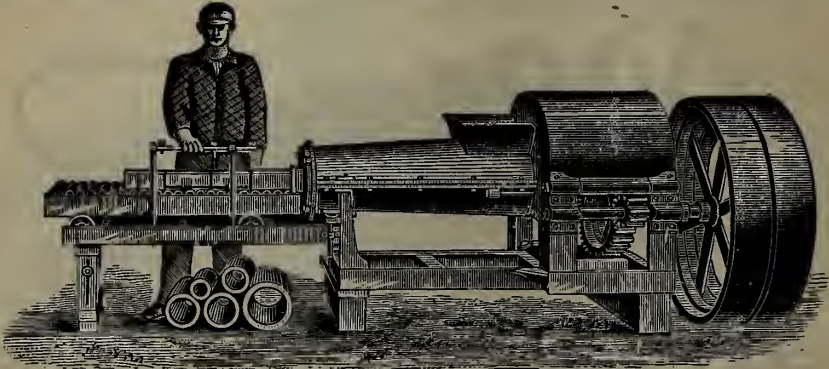
COLUMBUS, - - OHIO.



Advertisements.

KELLS & SON'S IMPROVED Brick and Tile Machines!

"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

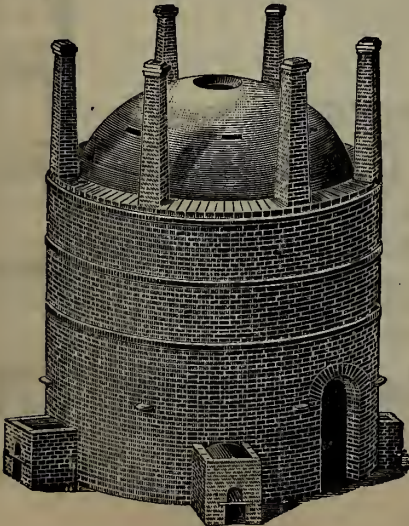
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

THE KILN SPEAKS FOR ITSELF.

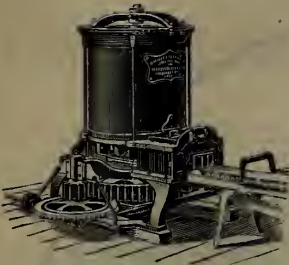
We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

64 Johnson Building,

CINCINNATI, OHIO

Advertisements.



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

Dry Cars;
Clay Cars;
Turn
Tables
and
Kiln
Castings.

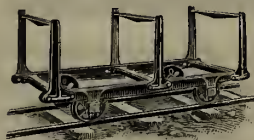


Pulleys;
Shafting;
Hangers;
Barrows
and
Yard
Supplies.

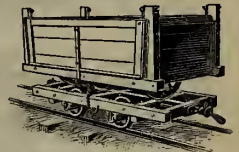
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



(Dry Car.)



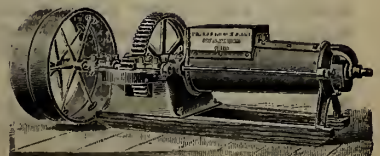
(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.

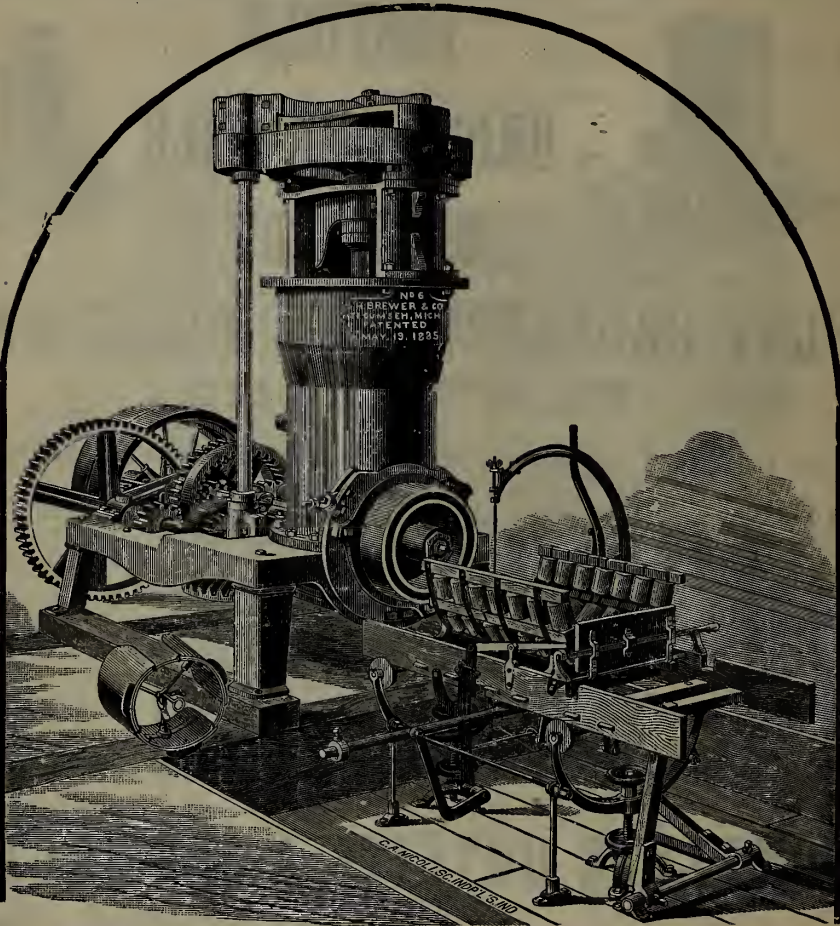


(No. 3 Crusher.)



(No. 7 Pug Mill.)

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Yours Truly, M. J. LEE.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machines.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

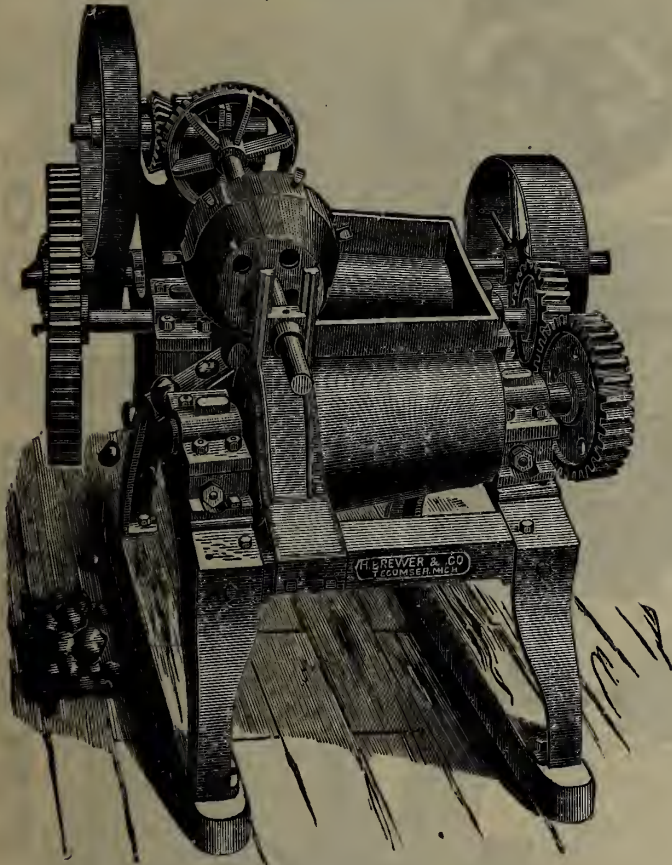
Yours Truly, JOLIET MOUND DRAIN TILE CO.

The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

The following are among the advantages claimed for this form of construction:

- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no heads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

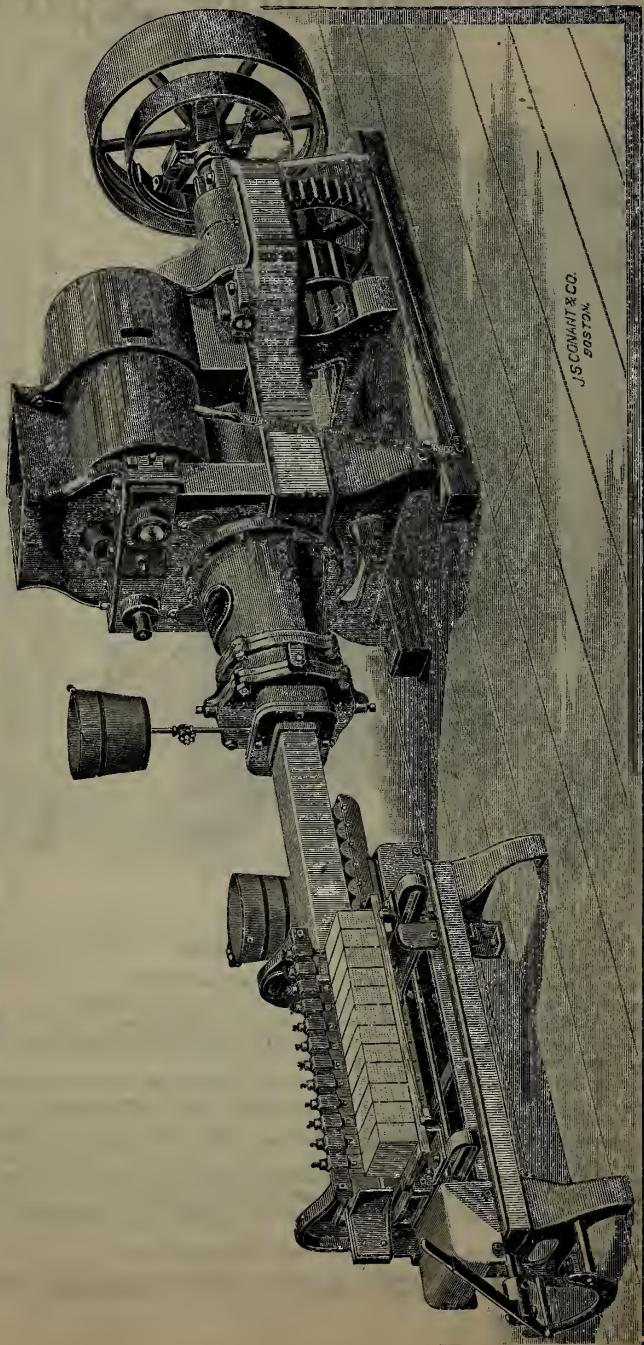
For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



J. SCOVANT & CO.
BOSTON.

"A" or Largest Size Machine with New Board Delivery Cutting Table.

Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

E. M. FRIESE & CO.,

PLYMOUTH, Richland County, OHIO.

[Mention this paper.

TRANSIT LEVEL

FOR THE USE OF

ARCHITECTS AND
BUILDERS.



FIG. 11.

This is a new, light and convenient instrument for leveling and taking horizontal angles without the Magnetic Needle attachment, intended for architects and builders uses.

The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and 2½ in my catalogue, the price would be \$60.00.

Send for Catalogue.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

T. F. RANDOLPH,
Surveyors' and Engineers' Instruments,

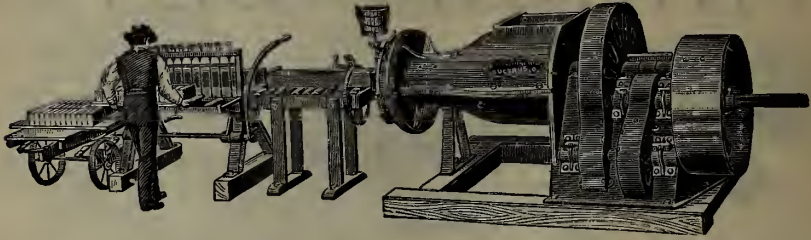
51 West Fourth Street, Room 31.

CINCINNATI, OHIO.

Advertisements.

FREY--SHECKLER CO.

BUCYRUS, OHIO.



The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.

The Mascot—the lightest running.

The Centennial—the best clay mixer.

We furnish full outfits for brick and tile factories.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.



Four and three roller
crushers with differential
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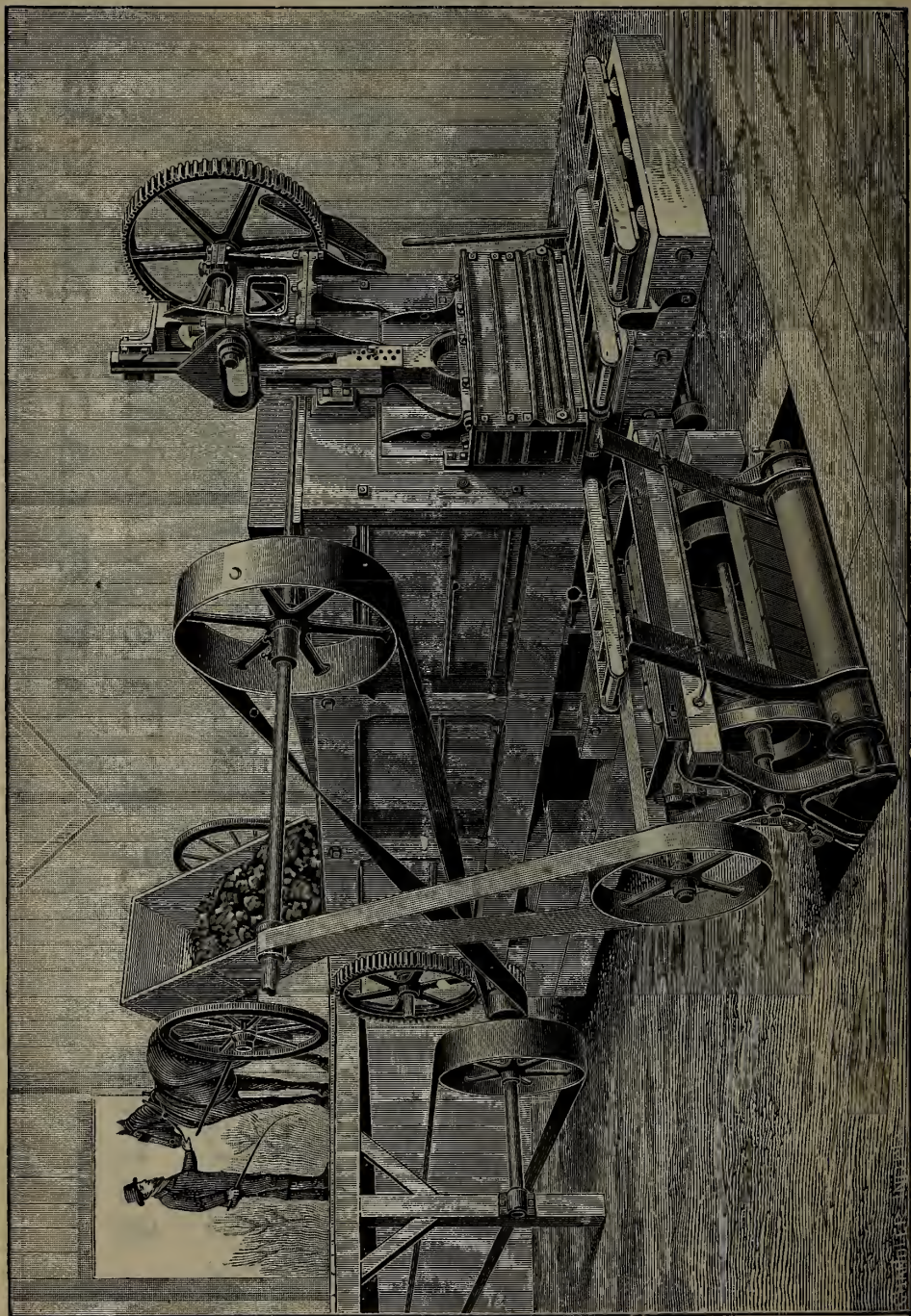


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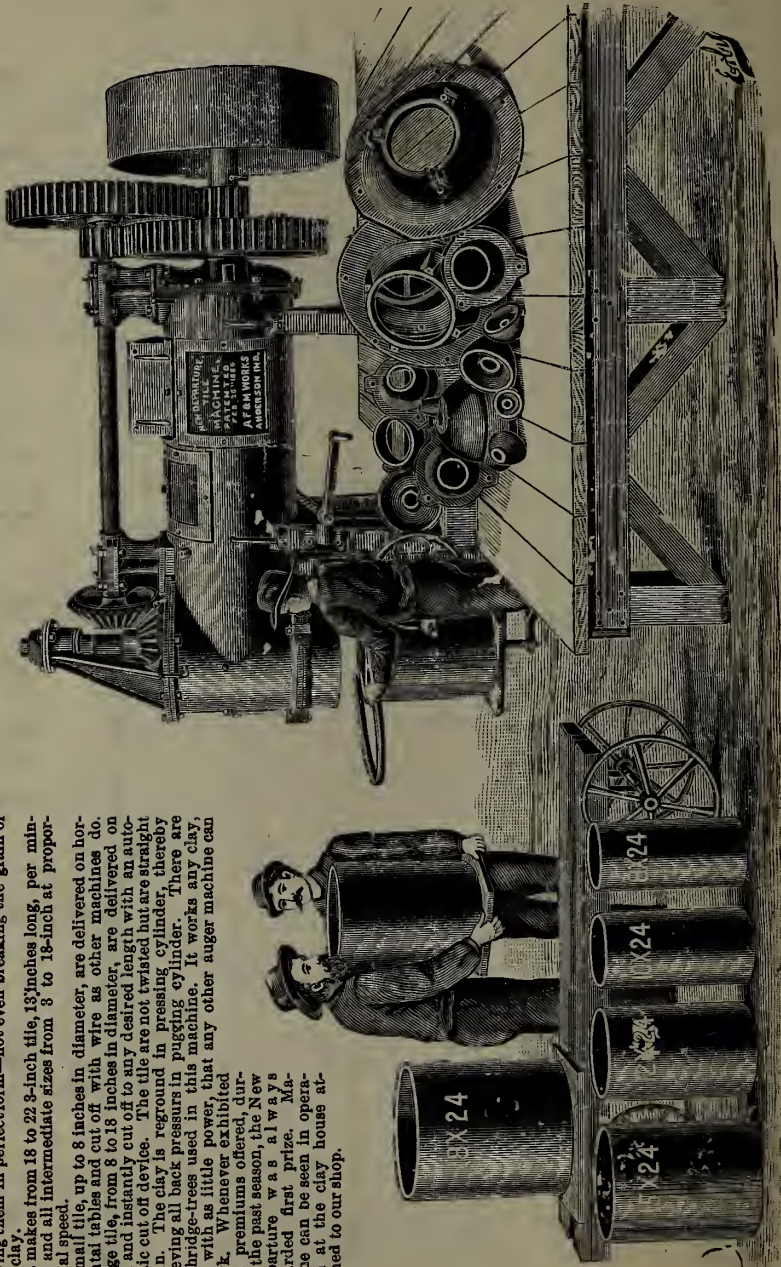
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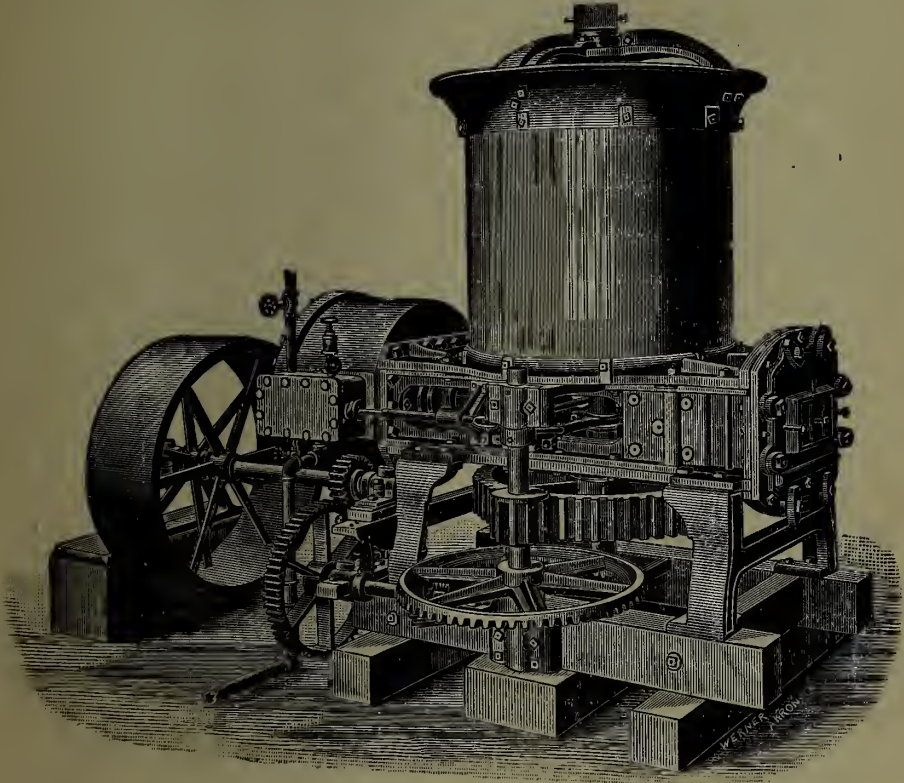
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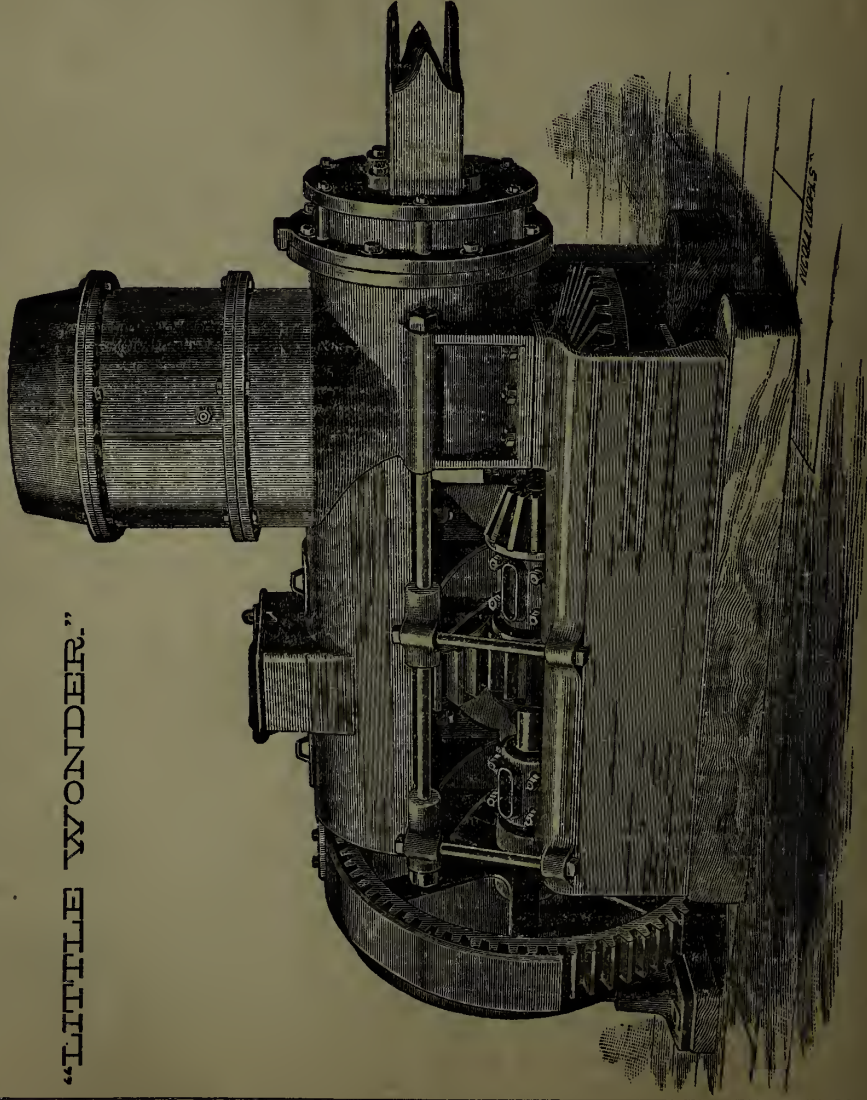
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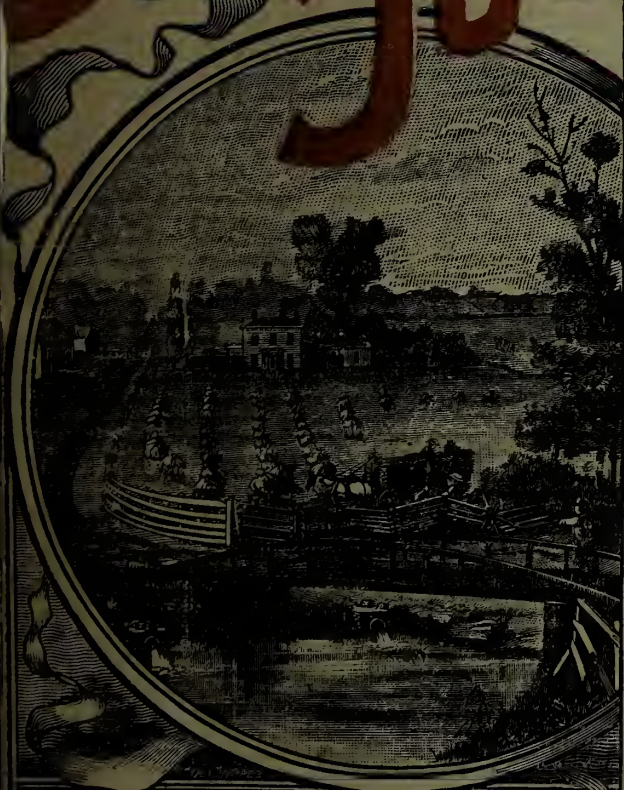


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THE DRAINAGE JOURNAL



APRIL, 1891.

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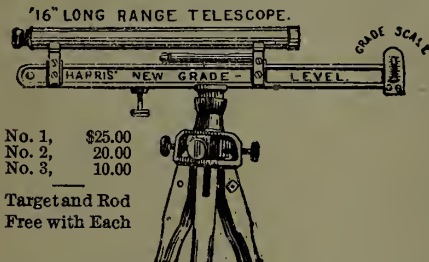


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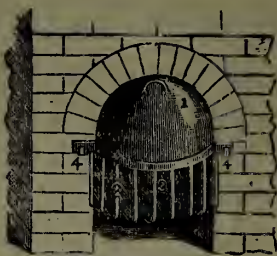
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THE DRAINAGE JOURNAL

Vol. XIII. APRIL. No. 4.

ACTION OF TILE DRAINS.

Land which requires drainage is that which at some time during the year, (either from an accumulation of the rains which fall upon it, from the lateral flow or soakage from adjoining land, from springs which open within it, or from a combination of two or all of these sources), becomes filled with water that does not readily find a natural outlet, but remains until removed by evaporation. Every considerable addition to its water wells up, and soaks its very surface, and that which is added after it is already brim full, must flow over the surface or lie in puddles upon it. Evaporation is a slow process and it becomes more and more slow as the level of the water recedes from the surface and is sheltered by the overlying earth, from the action of sun and wind. Therefore, at least during the periods of spring and fall preparation of the land, during the early growth of plants, and often in mid-summer, the *water-table*—the top of the water of saturation—is within a few inches of the surface, preventing the natural descent of roots, and, by reason of the small space to receive fresh rains, causing an interruption of work for some days after each storm.

If such land is properly furnished with tile drains (having a clear and sufficient outfall, offering sufficient means of entrance to the water which reaches them, and carrying it by a uniform or

increasing descent to the outlet), its water will be removed to nearly, or quite, the level of the floor of the drains, and its water-table will be at the distance of some feet from the surface, leaving the spaces between the particles of all of the soil above it filled with air instead of water. The water below the soil stands at a level, like any other water that is dammed up. Rainwater falling on the soil will descend by its own weight to this level and the water will rise into the drains, as it would flow over a dam, until the proper level is again attained. Spring water entering from below and water oozing from the adjoining land will be removed in like manner. In a well drained soil the water of ordinary rains will be at once absorbed, will slowly descend towards the water-table and will be removed by the drains so rapidly even in heavy clay, as to leave the ground fit for cultivation and in a condition for steady growth within a short time after the rain ceases. It has been estimated that a drained soil has room between its particles for about one-quarter of its bulk of water—that is, four inches of drained soil contains free space enough to receive a rain fall one inch in depth and, by the same token, 4 feet of drained soil can receive 12 inches of rain—more than is known to have ever fallen in 24 hours since the deluge, and more than one-quarter of the *annual* rainfall in the United States.—*Waring.*

Tilemaking.



OHIO TILE, BRICK AND DRAINAGE ASSOCIATION.

Proceedings of the Twelfth Annual Meeting.

The Convention was held in the A. O. H. Hall, Columbus, Ohio, and was called to order Wednesday, February 25th, 1891, at 10 a. m., by Mr. J. W. Everal, of Westerville, Ohio, the president being absent at the opening of the first session, but arriving later in the day.

The attendance was large, there being nearly one hundred present and an unusual interest was manifested by the close attention paid to the papers and discussions by all the delegates, few if any of whom, missed a single session.

After roll call, the reports of the members on the work of the year were heard, which, as a whole, were very encouraging.

Mr. Horlocker, of Columbus, O., then read an interesting paper, entitled, "Gleanings from Ten Years' Experience in Making Drain Tile," (which will appear in the next issue of the JOURNAL), after which the Convention adjourned till 2 p. m.

SECOND SESSION.

The meeting was called to order Wednesday afternoon with President Eudaly in the chair.

Mr. Geo. S. Tiffany, Tecumseh, Mich., was introduced and read a very instructive paper on "Brickyard Construction," treating in particular the subject of attaching the power so as to get the best results. We were unable to obtain a copy at the time but will probably be able to give it in full in a subsequent issue.

DISCUSSION.

Mr. Everal—The line shaft to our engine runs at about 140 revolutions per minute. Our piston travels about 90. The pulley on the engine shaft running the line shaft is, I believe, 18 inches, and the pulley on the line shaft 2 feet, 4 inches. There has been a question in my mind about whether it would be proper to run our engine at a higher speed than 140 revolutions. I should like to do it if the engine will bear it. It is 9 x 18, I believe. We would like to increase the speed of our mill. Of course we have a belt direct from the engine to the mill, and another belt from the engine shaft to the line shaft, and it has been a question in my mind whether it would be advisable to increase the speed of our engine higher than 140, whether the wear would be greater, or whether we would gain or lose in increasing speed. We have a 20 horse power engine and it taxes it to its full capacity to run the machinery we are now running, and whether or not we would get more power out of it by increasing the speed. Our line shaft runs the other machinery at a good rate of speed. I would like to have Mr. Tiffany's opinion of the speed of the engine.

Mr. Oakes—I would say according to Mr. Everal's statement that his driving

pulleys are too small in diameter. Mr. Tiffany's suggestions suit my experience. We started out with small pulleys in diameter on the line shaft and burned our place. Would say that our cylinder is 11 inches in diameter.

Mr. Tiffany—Mr. Everal's speed is 420 per minute. That is not high. If his engine is well made he can increase it to 500. I mean by speed so many feet travel a minute, not revolutions. It is 3 feet to each revolution. It would be one-third of 500. Mr. Everal should increase the driving pulley on line shaft to keep the motion the same. He would simply gain more advantage with his engine—he would get one-fifth more power.

Mr. Everal—If we increase the size of the pulley which drives the mill, it takes more power to run the mill, then we should have a smaller pulley on the engine shaft.

Mr. Tiffany—You should increase the size of pulleys on your line shaft.

Mr. Everal—We belt directly from the engine shaft to the mill. We run the mill direct from the engine shaft.

Mr. Tiffany—The engine in the works I had charge of has a speed of 552 a minute. We did not stop it but once in a three month's run.

C. W. Raymond—. I believe he can safely speed his engine from 140 to 200 revolutions per minute, if it is a sound, well built engine. I know manufacturers are putting an engine on the market at the estimated horse power of 60, and then depend on speeding it up to 80, 90, and sometimes 150.

Mr. Darnell—We have a Stevens engine. After the catalogue was out they got their engine and they rated it at 55 horse power. Ours runs 160, we drive a 34 inch pulley on the shaft. I thought the rating was pretty high, myself.

Mr. Tiffany—The first rating was

about the same. 10 x 16 at 50 or from 50 to 60.

M. Horlocker—I would ask if I heard right—that Mr. Tiffany advises the running of machine directly from line shaft. I would like to ask that in case of oil, it would not be more advisable to run the machinery, mill and line shaft with separate belts from the engine. Run the line shaft from the pulley on one side of the engine and the mill from the other.

Mr. Tiffany—It depends on the size of the plant. If you only had a brick plant you need not have any line shaft. Take a plant where they have two dry presses, pug mill, elevator, and brick machines, instead of putting line shaft over the dry pan, I would even run the dry pan with independent belts, so you could start or stop every one in a minute. If you put your line shaft over that you have all the power of your engine exactly on that line shaft.

Pres. Eudaly—The next number on the programme is "SOME NOTES ON DRY PRESS BRICK MANUFACTURE," by W. D. Richardson, North Baltimore, Ohio.

DISCUSSION.

Pres. Eudaly—Gentlemen, we have listened to an exceedingly interesting paper. We would like to hear from some of you on same.

Mr. Postle—Mr. Chairman, before we go any farther, I think we ought to tender Mr. Tiffany and Mr. Richardson the thanks of this Convention for their very able papers and request that they be published.

Motion carried unanimously.

Pres. Eudaly—We will hear now the next paper on the programme, which is a paper on "Pressed and Ornamental Brick," by C. W. Raymond, of Dayton, O.

After the reading of the paper, on motion of Mr. Everal a vote of thanks was tendered Mr. Raymond for his able paper. [Mr. Raymond's paper will be

published in a future No. of the JOURNAL]

Pres. Eudaly—Gentlemen, Mr. Raymond's paper is now open for discussion. Do not be backward about this. He certainly has gone to a great deal of trouble to prepare it for us.

Mr. Neff—How high do you set the press brick one above the other before you cross them?

Mr. Raymond—Two high; one above the other and then cross.

Mr. Neff—I have seen them set 3 or 4 high and then crossed.

Mr. Raymond—I was just going to call upon Mr. Townsend. I don't know any one more capable of giving us reliable information.

Mr. Townsend—I am not a member of the Association, but I would be willing to answer almost any question. In regard to pressed brick—we set two high. Ornamental brick we set perhaps four or five high, owing to the kind of ornamental brick, those standard ornamental brick we set 5 high.

Mr. Richardson—I would like to ask if he has any trouble with his brick becoming discolored, and how he overcomes it.

Mr. Townsend—Our experience advises us about what to guard against. We place them in different parts of the kiln.

Mr. Raymond—I would like to ask Mr. Townsend how many courses of pressed brick he sets in a kiln, and how many courses high is the kiln over all.

Mr. Townsend—About 40 courses altogether, about 15 or 18 of pressed brick. We bench perhaps two or three courses of common brick under the pressed brick.

Mr. Tiffany—I know in Philadelphia after they press the brick they put them in little columns, one above the other. Then they take them and put them in two columns of five, six and ten courses. Now, it strikes me this is a point for the

dry press brick men. I am somewhat familiar with the process in Philadelphia and they set them ten courses high in the kiln. I think at Findlay they set them over 4 courses high.

Mr. Richardson—Courses of four and sometimes three and two.

Mr. Griswold—Better two.

Mr. Richardson—I did not come here to advocate the dry press process or to induce anyone to undertake to make brick by this process. Mr. Tiffany does not like to advise men in moderate circumstances to enter the dry press process as it requires a great deal of capital. While, by the old process with a few hundred dollars you could do quite a business, and that will, also, be one reason why the dry press business will not become popular—because of the capital required. The question in my mind is this: Is not the time coming when the pressed and ornamental brick are going to be made by the dry press process, for the reason that where you have the capital you can make so much cheaper, and you know the tendency in manufacturing to-day is the massing of large amounts of capital together so that smaller establishments cannot compete with them?

Mr. S. E. Hagy—There, that is one feature about the argument that pleased me—that it requires \$50,000 to \$100,000 to conduct the business. That makes me feel that we are not going to be crowded out very soon. I want to refer you to a little experience in regard to the dry press process. Thirty-five or thirty-six years ago I was a laborer in this town hauling brick. Mr. Atchison and a few men I could name, had a contract to furnish 60,000 brick and they burned two or three kilns of them. It happened to be one of the parties to haul those brick, and we could unload them better with a scoop shovel than

anything else. Hope this is not the case all the time. I believe that there is certain clays in St. Louis and other places where they make them successfully, but I believe in this part of the country it will not be accomplished very soon.

W. B. McClure—I would like to ask Mr. Raymond if pressed brick can be burned successfully in down-draft kilns.

Mr. Raymond—Yes sir. I have seen a great number of down-draft kilns burning pressed brick successfully.

S. E. Hagy—I would like to ask Mr. Raymond how high he would set them in a down-draft kiln. Would you set them like you do in the up-draft?

Mr. Raymond—I should judge, in a down-draft kiln the manner of setting would be reversed and set wider at the top and closer at the bottom. I would like to have Mr. Eudaly give us his views.

[Cries for Eudaly].

Pres. Eudaly—I don't know whether it is just the thing for me to talk here, but when I have said enough somebody must head me off. You are talking of setting pressed brick now and not common brick. Pressed brick are made, gentlemen, to make fine looking buildings. They will not last any longer in a building than a common brick. They are simply used to beautify the building, or where a certain shade is desired. They must be set in the kiln so as to prevent melting and flushing. They must, also, be set so as to have all of the brick burned. There are two things required in a pressed brick that are also hard to accomplish with the same setting. You can burn the brick more uniformly hard in a down-draft kiln by setting them open at the top. In an up-draft kiln you will be more apt to get a greater number of hard brick by setting them open at the bottom. You get a larger

per cent. of purely hard brick by burning in an up-draft kiln, especially where you are burning pressed brick. In a down-draft kiln if you should set them loose at the top and have too strong a draft you would fail in burning the bricks. I think there are more men deceived about draft than anything else. Now if you set a down-draft kiln with the brick open on top you will either flush or mark a large per cent. The down-draft kiln will receive a very safe heat at the top before they are warm at the bottom. If not very careful they will fall apart and send the heat down and will spoil the brick. It is very difficult to prevent that.

QUESTION BOX.

First Question—"What is the length of time required to burn with gas?"

Mr. N. Whisler—Are you wanting to know about burning brick with gas or brick and tile? I am using gas—have been using it for three years, and as far as my experience goes, I find that I burn in just about the same length of time that I did with wood. I can make just as good a burn with gas as I did with wood. This is my experience in burning with gas.

Mr. Wagner, Covington, Ohio.—I don't want that idea to go abroad that there is no difference between the two. It depends a great deal upon the pressure. I find if I have plenty of pressure I can burn a kiln of tile in much less time than I can in any way I can invent with wood, because I can put the fuel in the kiln just where it is wanted.

Second Question—Does the kind of fuel make any difference in the quality of brick or tile?

Mr. Whisler—I have never used coal myself, I have used wood and natural gas and can tell no difference and I venture to say I can take a brick burned by gas and one by wood and I don't believe

there is a brick or tile man who can tell which is which.

Third Question—"Will a large drive pulley reduce the power of the engine?"

Pres. Eudaly—I suppose it is understood that the pulley and line shaft remain the same. We will take it that way.

Mr. Frey—It will diminish, of course.

Mr. Tiffany—The power of the engine is the same. It has more looseness to overcome.

Mr. Everal—The leverage is greater.

Mr. Neff—I asked that question. It seemed to do that in our case. We used to run our machine with a 15 horse power engine and we put in a 30 horse power. It don't much more than run the machinery. I think it is more in the motion than anything else. I did not know but the size of the pulley had something to do with it.

Mr. Tiffany—You claim you had a 15 horse power engine and now you have 30 horse power. It ought to have twice the power if rightly applied.

Mr. Neff—We used to run very fast motion with the small engine. Now we run very slow.

On motion, the meeting adjourned till 7:30 p. m.

THIRD SESSION.

The meeting was called to order Wednesday evening at 7:30 o'clock by Pres. Eudaly.

Pres. Eudaly—The first number on the programme this evening is a paper by Mr. Elsom, entitled, "Clays, Their Nature and Adaptability to Certain Uses."

The following discussion was had after the reading of the paper:

Mr. Simpson—There is nothing in this brickmaking business that interests me more than the composition of clays. I have studied clays ever since I began brickmaking some years ago. There is

one or two things about this not quite clear to me. The Milwaukee clay has an extraordinary amount of iron and yet we all know it makes a cream color brick. Every brickmaker will tell you that the color depends upon the iron in the clay, if I am correctly informed on that, and my authority is the city geologist of Milwaukee who claims that there are alkalies in the clay that neutralizes the effect of the iron. Now, if there are alkalies in the clay sufficient to do that I imagine it would effect the quality of the brick.

Prof. Elsom—The State Geologist of Wisconsin is right and he is wrong, and I know whereof I speak. The iron is not a neutralizer of the alkali but is taken up by the alkali and is of itself neutralized. Its coloring properties are eliminated and the constituents of the clays that are desirable for brick remain intact. I have a sample of clay that Mr. Frey sent me with but little alkali. And we burned the clay, and you must remember that these elements some of them are more fusible than others, and sometimes two elements melting will take up another element and form a fourth. There is a secret about this that clayworkers don't understand.

Mr. Billingsley—Are there two forms of iron. One which gives color and the other does not?

Prof. Elsom—Yes; there are two forms of iron.

Mr. Frey—Will you please tell us which of these constituent parts of clay you consider will combine and as flux melt together and vitrify—iron, soda, potash, aluminum.

Prof. Elsom—Chloride of alkali in various shapes.

Mr. Frey—Now, does these fluxes combine with the silica or aluminum?

Prof. Elsom—The silica. The aluminum will not combine in that way. But

it will combine and make a something that will look and act like silica, but not vitrify.

Mr. Frey—Another question. I find in some analyses a certain proportion of titanitic acid. Is that dangerous?

Prof. Elsom—No, sir. I would be a little afraid of that if the fire burned into the brick. Where you burn coal I would not be afraid to use it.

Richard Wallace—How would you neutralize lime?

Prof. Elsom—You could not neutralize the effects of lime after burning. The only way to neutralize lime is at the start. Now, there is a wide difference between neutralizing cause and effect. If I had a clay containing too much lime, I would get a clay that had an abundance of silica and you could flux out your lime easily that way. It would make a good brick. It would bother you some about making a fine face brick and would likely whitewash. Some of you people are situated so you can not get sand. Now I am paying for manganese only \$11 a ton and a ton of manganese would last an ordinary yard for a summer and then you will neutralize the lime. It is merely used as you would sand, dust a little over your brick.

Mr. Frey—Will manganese burn red in color?

Prof. Elsom—What temperature would you ordinarily apply?

Mr. Frey—I don't know.

Prof. Elsom—It will have a tendency to burn brown. I won't give you these as positive, accurate figures, but I think at about 100 it will burn a yellow, at 200 blue, at 300 red, and at 400 black. At about 3,000 it will burn a pretty dark brown.

C. W. Raymond—A great drawback to manufacturers of brick, especially in the Northern States, is the presence of limestone that they find it almost impossible

to get rid of, and the fact of it is some of them don't try to get rid of it, and it is detrimental in many ways to making brick successfully and the color is very bad. Now, they perhaps go on working these limestones up by pulverizing them. In an event of this kind can they neutralize the effects of it by manganese?

Prof. Elsom—Yes, sir. To neutralize limestone is much easier and cheaper than to neutralize lime as you originally find it in the clay. The lime comes in your brick as an extraneous matter, it does not hurt the brick.

F. M. Gardner—My tile, two-thirds of them, are a nice red on outside, break them in two and they will be a dark brown on the inside. Is this in any way detrimental to the tile?

Prof. Elsom—I think that perhaps after your tile are used you will see they are just as good as you can make them. I don't think they are injured. My experience has been that there is very few tile placed on the market that will not stand extraordinary pressure. There is very few that break.

Mr. Gardner—The reason I asked this question is, I sell a great many of them, and sometimes one of them gets broken and the people come to me and say, 'What makes that dark color?' I tell them I don't know. It is like stone. I can't tell you what it is. They have a perfect, hard ring.

Adjourned to meet at 9 o'clock Thursday morning.

FOURTH SESSION.

The fourth and last session was called to order Tuesday morning at 9 o'clock.

Pres. Eudaly—Gentlemen, you will please come to order and we will proceed with the business of the day.

Mr. Powell—I move that a nominating committee be appointed, consisting

of Mr. Postle, Mr. Wagoner and Mr. Tiffany.

Motion carried.

Pres. Eudaly—The first number of the programme this morning is a paper by J. W. Everal, of Westerville, Ohio, entitled

"TILE AND BRICK MANUFACTURE COMBINED," BY J. W. EVERAL.

If the Secretary had asked me to write about what I did not know about tile and brick making I could have prepared quite a lengthy article, but to tell what I know about it will only require a few lines. With fourteen years of experience in clay we have learned a few things; some by dear experience, but withal have succeeded fairly well. My bump of adventure is possibly smaller now than when I was younger in the business. Clays differ so widely in their composition that it is not safe to conclude that your clay will make this or that kind of ware because others are making it. If your clay will make a good brick it is not an unfailing sign it will make a good tile, neither is the rule infallible that clay that will make a good tile will make a good brick. However, I believe, a clay that will make a good tile, if properly handled, will make a good strong brick. Some clays seem peculiarly adapted to making tile, works free and easy, stands rapid drying without cracking, burns easy without any special care and with but little loss, while other clays are the reverse of all these qualities.

Different clays require different manipulation, some require more pugging than others, some are greatly benefited by weathering, while others are not. The only way to determine what process your clay should be subjected to, to give best results is by actual tests at your own factory. These tests can be made from time to time at a very little cost. A failure to produce good ware or to over-

come too great a loss in drying and burning, is seldom due to your *poor* machine. In many cases it is a lack of proper preparation of the clay.

Your clay may require throwing up in the fall and exposing to the action of the frost; this, however, is expensive, where it must be done by hand, and where a large amount of clay is used. Next to this weathering of clays I would recommend a number of soak, or tempering pits, with clay elevator through the center or along side up to mill. Keep from two to four days run of clay ahead, wet it sufficient when put in and thus, by standing three or four days, it will become pretty thoroughly tempered and make a better brick or tile. Unevenness in the temper of clay, some too dry and some too wet, with dry lumps mixed in, has a great deal to do with the cracking in drying and burning. The nature of your clay may demand more machinery than simply your tile or brick machine; we think it wise to exhaust the other means at hand that are inexpensive before putting in additional machinery.

If your present machine is too small, or is insufficient in its pugging capacity, or to do the amount of work desired, and you decide to put in a new machine, you have only to let the fact be known and you will soon have an opportunity to purchase without any special effort on your part. The gentleman that solicits your order first undoubtedly has the best machine, and of course you buy of him. After you have signed the contract for your new machine, I would advise you to take a trip to some adjoining State and remain away until your new machine is put in place and ready for business. You will escape many smiles and frowns from those pleasing gentlemen—machine agents—and save yourself from many a sleepless night, thinking you did not buy the best machine.

Is it practical or advisable to combine brick and tile making? I would say it is, to a certain degree, under certain conditions.

It is far more practical for all tile-makers to be brickmakers also, than for all brickmakers to be tilemakers also. With the addition of a die all tile machines will make brick, but it is not so with all brick machines, therefore with a small outlay every tilemaker can make brick. To what extent he can carry on the combined business, hinges on two or three things, first the adaptation of his clay for both, second necessary capital, third the market.

We think it advisable for all tile-makers to make and burn, at least what brick they need for kilns, buildings and repairs on the premises, you get a better brick for your purpose, beside saving the hauling, etc.

Now if it is desirable to go a little farther and make a few for home demand, which nearly every small tile-maker has more or less, it can be done at odd times during the season and not interfere with the output of tile. I speak now of small factories of one and two kilns capacity with a limited demand for tile.

But now, gentlemen, when you come to increase the output beyond this on both tile and brick it means business, yes, it means all three things above stated, viz. kind of clay, capital, and market. A careful, cool survey, should be taken of all the requirements necessary to make the increased adventure a success. In considering the first requirement, is your clay adapted to making both tile and brick, quantity, and quality considered, clay within easy reach of your works? Second, have you sufficient capital to put in an improved plant, or are your buildings, kilns, etc., in shape to add to, to make a combined business

profitable. Third, your location will have something to do with your market; to have a good location for making tile you want both a good local and shipping trade. Your market for brick depends somewhat on the kind of brick made, however, a home market is always preferable, the price of common building brick will not bear long transportation; freight charges consume the profits. It is some better with street pavers and fine pressed brick; in this you have a wider field, if you have a good article.

In looking the ground over, and having had some little experience in the combined business, and seeing some of the disadvantages incident to the system, for several reasons we do not think it best or advisable. Very nearly all the tile factories built in this State, were built for the express purpose of making and drying tile, and are not at all suitable for drying brick. A very large proportion of these factories are summer factories and dry by natural air, which process is very slow in the average tile dry house. Therefore, buildings that serve the purpose well for making, drying and handling tile, do not answer the purpose for drying and handling brick economically. To make brick successfully and meet your competitor, you must have the facilities for handling your clay and brick with the least amount of labor. If you make a paving brick your tile machine will do it, but if a sand mold brick, or a dry press, or a fine front brick, you want a machine best adapted to the kind of brick wanted. At any rate, if you are known to be in the market for *any kind* of brick you will have use for the brick machine aside from making tile. The drying of brick, by whatever system you may adopt, should be complete and certain, and should be so arranged as to handle the brick from machine to dry house and so on to kiln with as little

labor and expense as the best construction will afford.

The brick business has assumed a different phase in the past few years. Not only has the demand for building brick been increased, but since the discovery that hard burnt brick is the best known material by which to pave our streets and roadways, the demand is one not to be met by any slow process. The primitive way of making brick is fast passing out of favor, since improved machinery has come to our aid for the rapid manufacture. It follows that improved methods must be resorted to in the drying and handling and burning of same. You would hardly think of engaging in the brick business to any extent now without a full equipment and the best facilities for carrying on the business successfully, and be able to compete with your competitor; all this means a vast amount of capital. Neither has it any connection with the making of tile. I mean by this, the plant for making brick is *one*, and the plant for making tile is another. Although they may be separated, only by a partition between the brick and tile machines, using the same power for both but taking the tile one direction and the brick the opposite direction, with this much separation of the business we think that tile and brick making may be combined under one supervision and be operated successfully. Paving brick if wanted at all are generally wanted in large quantities and to do this the ordinary combined outfit is incapable of doing it.

I am aware it is argued that tile and brick making go well together since all tile machines are in some degree brick machines, and, as I have said before, tile and brick making will go well together to a certain extent. A tile manufacturer may be so situated that the demand for tile be limited, he may be able to sell a

few and meet a local demand, he also may be so located as to have a demand for brick, and so by combining the two, do a fair business.

However, here comes in a drawback in many localities which is hard to overcome, and that is the wire-cut unsanded brick. The end-cut brick is objected to because of a rough end and looks bad if heading courses are laid, the side-cut are better on this account; the end-cut answer well for walks, street paving, foundations, and where the end is not prominently exposed.

I find, too, that common bricklayers do not like to lay a wire-cut brick or one that is not sanded, for the reason that in striking off the mortar and striking the joint they "nuss the brick," and the work looks bad. It takes a tidy bricklayer to lay a machine brick unsanded and do a clean job, for this reason common bricklayers work against the use of wire-cut brick.

Now, in conclusion, I would say, if you have an abundance of good clay, with plenty of capital behind it, with this *broad country* for a market, I know of *no law* that will deny you the privilege of sacrificing your clay and your means, for the good and comfort of the dear people.

Pres. Eudaly—Gentlemen, Mr. Everal's paper is open for discussion.

Mr. Tiffany—I rise to a point of order. We gathered here yesterday morning, and our president was missing, and the first thing on the programme was the President's Address, now I think the next thing on the programme this morning should be the President's Address.

Pres. Eudaly.—I am sorry to say, that as much as I would like to make an address I will have to rule you out of order.

Mr. Wagoner—I appeal from the decision of the chair and move that we

now hear the President's Annual Address.

Cries of "Second the motion.

Motion carried.

PRESIDENT'S ADDRESS.

The President, W. A. Eudaly, of Cincinnati, was requested to address the Association, which he proceeded to do extemporaneously. He reviewed the work of the Association in the past—what it had done in disseminating a knowledge of the clay industries. He spoke of the advance that had been made and of the future full of promise. He spoke of the high character of the papers read at each annual meeting, and, in conclusion, said: "We should congratulate ourselves upon the success of our State Association. While I admit that many frivolous things come into our discussions, many things are discussed to bring out little that is new, but the professor of an educational institution says you don't learn so much from the new things as from constant review. Take our educational journals printed throughout the country, they review, review, review; so it is with us, while perhaps, many things come up that is not new, yet constant reviewing impresses them upon our mind.

"Another thing, gentlemen, we don't want to overlook, the fact that heretofore the papers and such remarks as the trade representatives and the trade journals could gather up in the Convention have been published. These publications have done us a vast amount of good. We hear the papers read here from the floor—we can't put many of the arguments together as the papers are read rapidly; we have not the strength of mind to do it. When a paper is read, then a short discussion, then another paper is read and we lose much of the matter that is produced in the Conven-

tion, so that the publication of these papers have aided us very much.

"Now, gentlemen, let us seek that which is best for our own good. Let us, in the future use the columns of our trade journals, to speak to one another during the entire year. Let us not hesitate to answer the questions that may be propounded in their columns one to another. We don't lay hold of this as we should. We should improve the opportunities of using the columns of the various trade journals and in this way we can have a Convention the entire year.

"I thank you for the attention, and trust the stenographer will make such corrections as she thinks best. [Laughter.] (Turning to the stenographer), Send me proof and I will cut out several pages." [Applause.]

Mr. Wagoner—We have with us today the father of this Convention. No man has done for this convention what this man has done. He is always ready to give us something on tile drainage and if he is prepared this morning, I would move that we tender him a portion of our time. I suppose you all know that I refer to Mr. J. J. W. Billingsley?

Cries of "Second the motion."

Motion carried.

Pres. Eudaly—The next number on the programme is a talk by Mr. Billingsley.

Mr. Billingsley—There is a story told on Gov. Foster, over in my State, and as the Governor has recently been appointed Secretary of the Treasury, it may be well to tell it here. On one occasion he was visiting the penitentiary and they called the prisoners together that he might speak to them. He commenced the speech by saying, "Gentlemen, I am glad to see you all here." [Laughter.] I feel very much like the

governor, this morning, I am glad to see you all here, and I would say in connection with what Mr. Eudaly has said, the attendance has been more regular at this Convention than at any ever held in this State. I counted this morning 74 people, and last night 75.

I have a paper here that I read before the Iowa Convention. It is in the form of a story, and was intended really to bring out some points in the manufacture and use of tile. I am afraid it will prove rather an old chestnut to my friend Pike.

Mr. Billingsley then read his story entitled "Anna and I," which briefly outlined the history of a man and wife and their management of a tile factory and 40 acres of land, the latter furnishing half the capital and taking an active part in the business—making a success of the tile business and a superb home on the 40 acres of land.

Mr. Raymond—Was the plot of this story laid in this country.

Mr. McClure—I would just like to say to Mr. Billingsley, that as he travels over the country, and sees ladies like the one he described as Anna, if she wants an interest in a tile factory and has \$783, that she can have an interest in the Warsaw Tile Factory. [Laughter]. If Mr. Billingsley will give me the address of such a young lady I will try and come over to the next convention of the Ohio Tile, Brick and Drainage Association with a new partner. [Laughter and applause]

Mr. Billingsley—I would like to say to the brother, Be not discouraged, there are such women.

Mr. Elsom—I think it would be in order to appoint a committee to assist Mr. McClure.

Pres. Eudaly—I will appoint such a committee with Mr. McClure as chairman.

Mr. Elsom—It is a good investment.

When I was married I was 85 cents in debt, and have paid it all off.

ELECTION OF OFFICERS.

Pres. Eudaly—Such scientific questions are too much for me, we will pass in the next order of business which is the election of officers. We will hear from the nominating committee.

Mr. Postle, Chairman of the Committee—Our committee reports as follows: For President, J. W. Everal, Westerville, O.; for Vice President, B. W. Blair, of Cincinnati; for Secretary, W. D. Richardson, North Baltimore; for Treasurer, S. E. Hagy, Etna, O.; for Programme Committee, J. W. Everal, B. W. Blair, W. D. Richardson.

Mr. Hagy—In making changes, would it not be well to change the treasurer also.

Mr. Wagoner—First man I ever heard of who was tired of money.

Mr. Billingsley—I move the adoption of the report.

Motion carried.

Mr. Randall—I move that the Secretary of this Convention cast the unanimous vote of the Association for the election of the gentlemen named by the nominating committee for the officers of this Association for the ensuing year.

Motion carried.

Mr. Landrum—I have no doubt, but that Mr. Everal will make a good presiding officer, we have faith to believe he will, but, nevertheless, I, for one, am in favor of tendering our retiring officers a vote of thanks for their services. I make this as a motion.

Motion carried.

Pres. Eudaly—We will take up the order of business. The next order on the programme is an address on "Drying and Burning Drain Tile," by Mr. Elliott, of Pittman, O.

Mr. Elliott spoke extemporaneously, telling of his personal experiences in making tile in a very entertaining man-

ner, that elicited a lively discussion of the subject.

"DRYING AND BURNING DRAIN TILE."

Gentlemen of the Convention:

I feel unable to address you upon this subject to-day. It is a subject that requires more ability than I have, to do it justice. But the time is getting short and I suppose a great number of us want to take the noon train for home, and I will not detain you but a short time—merely give you my experience in this business. Whether or not what I have to say will apply to brickmaking I don't know. In my clay it is very necessary that I have the walls of my tile exactly alike, and that I have the die exactly in the center. If one side of the wall is heavier than the other I find the tile will be crooked. Now as to the methods of drying tile. There are several. I tried at first to dry them in the open air, and I could not succeed for the reason that I could only manufacture for a part of the season, I had to quit in the fall and could not begin in the spring until my best season was over. I abandoned that system and tried the dry room. It has been said here that there is a difference in clays in drying. Some you can dry faster than others. I have had very little experience in any clay but my own. I am satisfied I can dry my own clay in 24 hours. In the clay I had, when drying in a way that I could not apply the heat equally on both sides of the tile, one side would dry faster than the other side, and consequently would warp or crack. So it is necessary to dry it evenly on all sides. I found that the expense of the shed room to dry with air was too great; that it took too much room and too much time. I have room enough to house them for three days. I have room enough to floor them. I heat the floors with steam so I can dry my tiles

in 24 hours. The next day I heat my second room; that will give the other room more time. Consequently, I find I need so much less room to dry in than if I had let my tile stand for a week. I have adopted the plan of drying my tile in 24 hours; I don't say you can all do that, but the object in applying the heat equally is, that we can dry our tiles in the time named, so that we can empty the first room, that we need just that much room in drying tile. I dry my tile with escaping steam from the engine, instead of allowing it to escape out in the air and losing it. I run it through the pipes until I use it up. I think it costs very little, if any, more fuel than it does to throw it away, that is, if you have pipes large enough. Then it is necessary for you to have dry room enough to keep out of the way of the mill, and have kiln room enough to keep out of way of the dry room. While my mill men are filling the third room I am emptying the first room of the kiln, and when they have to fill the first room others are emptying the second room. So we always have enough room and save the expense of stacking them up. Now, after we have dried them comes the setting of them in the kiln. I may differ from others of you here, in the setting. With me, the setting depends upon the amount of small tile I have. If I am sure of small tile, I will set my kiln 5-inch and nest with 2 to 3-inch, and then run up from that to 6-inch and nest with 4-inch. It is my experience that it is the best way. Always filling my 4's with the 2½ and 2. I would proceed in that way until I get my kilns full, then I would start my fires very slowly to get rid of the water-smoke. That has been discussed here a great deal and it is an important point. I find whenever I am in a hurry and want to get a kiln of tile out quick, I am

very apt to spoil them, for the reason that I fire up before the kiln is perfectly dry. I start a fire and keep it up for from two to three days, until there is no dampness. I open the doors and put my hand in, if there is no moisture there I think it is time to fire up. Then I increase my fires until I get my fire holes full. Be careful in putting in your fuel so as to fill the fire holes. A new beginner usually puts the fire too far back in the fire holes. I give my kiln plenty of draft, and fire up and keep my kiln full of fire and allow no cold air to get in the kiln.

There is a difference between practical burners and mechanical burners. I have had burners that would fire by the watch every twenty-five or thirty minutes, and have nearly as much fire on the outside as in the inside, and then go and sit down and look at his watch and when the thirty minutes was up go and fire up again. I have never known this to fail from giving a black top kiln. I prefer to have the burner going around adding a little fuel as the fires may need it and keep up a regular heat and the fire holes full of fuel. I fire for about 36 hours and then begin to notice the top of my kiln, if it begins to settle right on top then I burn 8 to 10 hours longer. So that it takes from the time I commence until I finish, about 45 or 50 hours.

I find that much of the talk since I have been here, has been on water-smoking, and I am satisfied in my own experience that the greatest trouble we have, is we fire up before the tile is perfectly dry. I can burn a kiln perfectly black, but it is done by irregular firing.

Gentlemen, I have talked for some time, and will now close with these remarks.

Thanking you for your attention.

DISCUSSION.

Mr. Tiffany—I don't know when I have heard a more practical talk and it is extemporaneous. I trust the stenographer will give it to us in full. I would like to have Mr. Elliott explain the manner of heating the three different rooms.

Mr. Elliott—I have pipe running under the dry rooms, but I have not got them finished, but I propose to run about 250 feet through the building probably of 5-inch.

Mr. Tiffany—Don't you have a way of shutting the heat from the room?

Mr. Elliott—I don't propose to shut off the heat. The rooms are 40x48, on two floors.

Mr. Powell—I suppose he burns in a down-draft kiln. He says he shut down the damper, and burned the bottom. I would like to ask him how he is going to get the heat to the bottom of the kiln.

Mr. Elliott—I don't know whether I can explain that to you or not, but I know it from experience. I had a man that burned for me in 46 hours. He was a practical burner. He burned for me four years, and he could not burn any better at the end of the fourth year than when he commenced. I said to him a great many times, shut off the draft and he said, "It will ruin the top." I said, "Experiment with it, if we spoil the kiln it is my loss." I could not get him to do it. Finally, one day he was called away, and I went at it myself—the first kiln I had ever burned. I fired it on top, as I described, until my kiln was nearly done, then I shut the damper in the stack. I did not shut it entirely down, of course. I damper my kiln down until you will see the smoke in the peep hole, then I consider I have my kiln dampers about right. I fire with coal exclusively.

Mr. Everal—How often do you fire?

Mr. Elliott—I want my fireman to have his shovel and pick in his hands all the time. I want him to go around with coal continually. Sometimes one fire hole will burn down oftener than another.

Pres. Eudaly—We will now have a paper on the "Approved Methods of Laying Street Pavements," by H. S. Hallwood, Columbus, Ohio.

Mr. Hallwood read a lengthy paper devoted chiefly to the advocacy of the Hallwood block as a paving material. The paper was not what had been expected, and as the hour was growing late and many of the members desired to leave for home, there was no discussion of the paving question of any consequence.

Treasurer Hagy read his annual report, which showed a small balance on hand after defraying the expenses of the meeting.

Mr. Powell—I move that we adjourn to meet the second Tuesday and Wednesday in February, 1892. [Carried].

Correspondence.

Aeration of the Soil.

Editor Drainage Journal:

How Dame Nature conducts her toilet in Louisiana I do not know. Here in Madison County, O., experience and observation have taught me that a ditch with no fall is better than no ditch. A ditch with slight fall is better than one with no fall and that a ditch with plenty of fall everything else being equal, is the best of all. A tile drain with outlet submerged two or three feet, is better (maybe) than no tile drain. A tile drain with its outlet little below the bottom of open ditch is better than if two or three feet below. An outlet even with the

bottom of open ditch is better still, and an outlet clear clean above bottom of open ditch best of all.

There may be a condition of things where Mr. F. L. Delfer resides to warrant such a practice as is outlined by him in the August number of the JOURNAL. Permit me to notice the theory advanced that the tile must run *full* at outlet in order that air may be *sucked* in from above along the line of the drain and aerate the soil. (If the water in the soil is so abundant as to keep the tile full there is no room in it for air). If the only aeration the soil receives is that received during the time the tile runs full at the outlet, its aeration would be meagre indeed.

The action of the air in a tile drain (*if its outlet is not submerged*) in the aeration of the soil may be illustrated by the action of air in a coal mine having shafts of different elevations or heights. In winter the cold air flows *down* the shorter shaft, absorbing warmth (heat) from the warmer coal mine surface within, expands, and, being lighter volume for volume than the inflowing, cold air, is forced *up* the longer shaft and out into space above. The reverse of this is true in summer. The air flowing *down* the long shaft gives a portion of its warmth to the coal mine surface, contracts, and, volume for volume is heavy, so that the column of air in the long shaft anti-buoys the column of air in the short one and air flows *down* the long shaft and *up* the short one. Sea and land breezes further illustrate the subject.

So with the tile drain. In winter, the air that fills the tile drain is warmer than the outlying cold air, and, volume for volume, is lighter. So it is forced *up* through the pores of the superincumbent soil by inward pressure of the outlying cold air at the outlet, which, flowing into and up the tile drain, absorbs

warmth from tile and adjacent subsoil, expands, and now being lighter than the outlying air, is, in its turn, forced up through the soil as its predecessor. This process is reversed in summer. The superincumbent air descends through the pores of the soil to the drain below, giving off warmth to the adjacent colder subsoil as it goes, and, condensing, becomes heavier volume for volume, than the outlying air at outlet of drain and so flows *down* the drain (like water) and out into open space.

Indeed it may be doubted which is the greater service rendered the soil, by the drain, the removal of the excess of moisture from it, or its aeration.

The soil is Nature's laboratory in which plant food is prepared. The great solvent in the preparation of plant food by the soil is air. Give it, then, a fair field and means of complete ingress and egress into and out of the drain.

Mother Nature is a good old soul. I admire much her manner of doing things, so far as I am able to understand it. Though she scares me sometimes with cyclone and thunderbolt, yet these are grand exhibitions of the way she wields the rod of correction.

OVERFLOW PHILOSOPHY.

I was much interested in reading the communication of Mr. F. L. Delfer, St. Patrick, La., in a recent number of the JOURNAL. I knew it was true that the surface of the land along and adjacent to the channel of the river, is generally higher than that next the "foot hills," (please admit the term) but had not given it a second thought until reading his article. This is due to the action of the water of the creek or river in motion.

The onward rush of water at the time of a rising flood tide, is higher in the channel than in the outlying, more shallow and quiet water, covering the overflowed bottom lands. This causes a flow

of the silt laden water from the channel to the sides. This silt laden water, as it becomes quiet, drops down the heavier suspended matter first in its outward flow, next the lighter, parting with the finest treasure at the "foot hills."

This process is repeated at every overflow of the bottom land, and, in time, materially raises the surface next the channel, while the elevation of the land at the "foot hills" is slight, and thus the manner in which the suspended silt is dropped tends to give a uniform surface slope from front to back.

It is highly probable, however, that the present conformation of the Mississippi valley, from the Ohio River to New Madrid, above and below, is largely due to a series of earthquake shocks that visited the district in 1811.

For months there were a succession of subterranean waves (I am at a loss for a better term) from the southwest to the northeast, damming the Mississippi River across here, obliterating its channel there and forming a lake yonder.

So great were the changes wrought that it would be merely paradoxical to say that the Mississippi became a "half drowned river."

The valley, in the main, was much elevated and the "Father of Waters," without map, chart, or compass, began the work of constructing for himself a new channel. There he utilized the old channel, there he cut through an opposing dike, that subterranean forces had playfully thrown across his pathway or constructed a channel around it, while yonder he divided his waters between two equally depressed routes, forming an island between, a gem in his placid bosom.

These subterranean waves caused great gaps or cracks in the earth's crust extending irregularly northwest and southeast, gapping open 15, 20 or 30 feet wide

on top, a hundred or more feet deep, only to close the next instant upon the infallen trees, houses, beasts and man along its line, while this process was repeated many times by the advancing wave. In some measure and as affording a slight security against these all devouring caverns, the people fell trees to the northeast and abode upon them as the dividing rent was rarel wide enough to take in in its gapping mouth the length of a tree.

So awe inspiring, so terrible were these throes that the beasts of the forest and birds of the air lost all fear of man and came to him for protection from a common danger. The forces of this seismic disturbance was at, or near New Madrid, from whence its ever lessening forces ended in mere tremors in Indiana, Illinois, etc.

I should think it would largely pay the land holder to tile those open ditches, (or the most of them), of which Mr. Delfer speaks, and reclaim them to cultivation. This would pay in two directions. They would become productive territory as the adjacent land. Then the resulting comfort in farming.

J. ARNETT.

London, Madison Co., Ohio.

Wants to Know About Dryers.

Editor Drainage Journal:

Will some one or more of your many readers give through the JOURNAL a brief description of the construction of their drying rooms? The flues, if flues are used, or if steam pipe are used, give size of drying apartment and the amount of pipe required, etc.?

Others beside myself are interested in putting in some kind of a dryer for drying tile. I hope that some of your readers will take the time to comply with this request.

T C. B.

Farm Drainage.



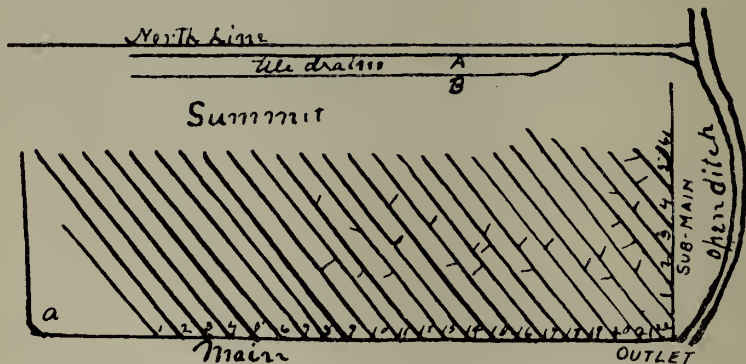
DRAINING THE "STICK."

It may be surprising news to the majority of the readers of the DRAINAGE JOURNAL to be told that while the course of immigration is west and northward to the states of Kansas, Nebraska, Minnesota and the Dakotas, many emigrants on their way to their new homes pass as fertile a region as can be found in this country, and where land may be acquired nearly as cheap as in the west; with this advantage, however, that this fertile region is close to St. Louis, one of the best markets in the United States.

St. Charles County, Mo., noted for producing the best corn raised anywhere, has many thousand acres of alluvial land situated between the Mississippi and Missouri Rivers and settled by a well-to-do, intelligent and industrious class of farmers who, by their diligence and good management, have improved most of the land to such an extent as to give it a value according to location, of from seventy-five to two hundred dollars per acre. The sandy land runs in streaks, varying in shape and dimensions and has a natural drainage. But between

these sandy lands there are streaks of what is called in the local parlance "stick land," a heavy black or blue alluvion of a sticky, tenacious and impervious nature which until lately has been found unprofitable to cultivate owing to the fact that the surface drainage has been exceedingly difficult, involving too much annual labor, expense and loss of land, owing to its liability to wash away, or caving of the ditch banks. For this reason the land has been utilized as

the corn crop of 1889 was standing in the field and was not gathered until the latter part of May and beginning of June, 1890. It is no wonder that this land can be bought for from twenty to thirty dollars per acre while the sandy land lying right alongside of it commands ever so much higher a price. But unprofitable as this "stick" is without drainage, it can be converted into the most productive soil with proper drainage as has been demonstrated in the



pasture chiefly and is poor pasture at that. Where the cultivation of this kind of land has been attempted, it has resulted disastrously to the farmer, producing good crops only in the most favorable seasons because, with imperfect surface drainage. This land is wet too long in the spring to permit the timely planting and cultivation of the crops. If a dry spell sets in afterwards, the the ground bakes and cracks, breaking the roots and stunting the crop. It also happens frequently that if, during a favorable season, a good crop is raised, a rainy spell during harvest prevents the cutting of the wheat or other small grains; or, if in the fall, hinders the gathering of the corn to such an extent as to cause the loss of the entire crop or part of it, by the sprouting and rotting of the grain. I know of instances where

		Feet.		
Main to "a".....		3,400		
Curve and continuation.....		891		
Sub-main.....		1,005		
Lateral on sub-main.....	No. 1...	1,000	Spurs..	79
" " " " " " " " " " " "	" 2...	800	"	155
" " " " " " " " " " " "	" 3...	596	"	167
" " " " " " " " " " " "	" 4...	500	"	60
" " " " " " " " " " " "	" 5...	300	"	80
" " " " " " " " " " " "	" 6...	198		
Lateral on main.....	No. 1...	500		
" " " " " " " " " " " "	" 2...	900		
" " " " " " " " " " " "	" 3...	900		
" " " " " " " " " " " "	" 4...	900		
" " " " " " " " " " " "	" 5...	900		
" " " " " " " " " " " "	" 6...	900		
" " " " " " " " " " " "	" 7...	900		
" " " " " " " " " " " "	" 8...	900		
" " " " " " " " " " " "	" 9...	900		
" " " " " " " " " " " "	" 10...	900		
" " " " " " " " " " " "	" 11...	900	"	60
" " " " " " " " " " " "	" 12...	900	"	168
" " " " " " " " " " " "	" 13...	900	"	162
" " " " " " " " " " " "	" 14...	900	"	77
" " " " " " " " " " " "	" 15...	9 0	"	63
" " " " " " " " " " " "	" 16...	900	"	158
" " " " " " " " " " " "	" 17...	900	"	175
" " " " " " " " " " " "	" 18...	875	"	160
" " " " " " " " " " " "	" 19...	880	"	158
" " " " " " " " " " " "	" 20...	900	"	154
" " " " " " " " " " " "	" 21...	900	"	80
" " " " " " " " " " " "	" 22...	1,000	"	145
Drain A.....		2,400	"	100
" B.....		1,950		
Sum total.....		32,495		2,201

case of Mr. Leeburger and Mr. J. F. Rauch, for instance. Mr. Leeburger, formerly a resident of Macon Co., Ill., owned 160 acres of tile drained land there which he sold and with the proceeds bought a section of land in St. Charles Co., Mo. He commenced forthwith to tile drain a part of the new land and had the satisfaction to raise as much of the finest St. Charles white corn as to almost pay the first cost of the land the first season.

Mr. J. F. Rauch, Secretary of the Board of Trade at St. Charles, who has a tract of 400 acres of land adjoining Mr. Leeburger's, employed me last spring to tile drain a hundred acres of his land. After a careful survey and study of the lay and nature of the land, I devised a plan to tile drain this tract as thoroughly and cheaply as it possibly could be done and as is shown in the accompanying plat.

There are a good many small ponds and low places on the land scattered promiscuously, and varying in depth from 8 to 18 inches which cannot be reached or tapped and the tile run with any regularity whatever. To run through the low places and the ponds only with the tile, would not insure satisfactory drainage for the reason that the water-shed from the higher ground to the lower places would accumulate in too great quantities to be absorbed by the soil and carried off by the tile, because in these low places the soil is of the most sticky, impervious character.

The only feasible plan seemed to be to run the tile drains obliquely to the rows and regular distances and to lay out the work in such a manner as to strike the most low places and drain the higher ground at the same time so as to carry the water off from the higher land by the tile before it reached and accumulated in the lower places. Such ponds

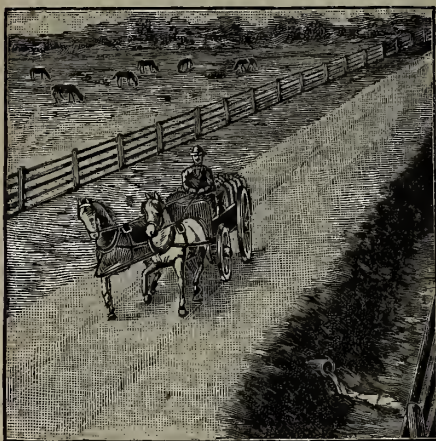
and low places as could not be reached with the straight lines of tile, had to be tapped by spurs running out from the laterals. I adopted this plan, running my main along the south line of the land, commencing with 8-inch tile. I ran a sub-main into it and 22 laterals at a hundred feet apart, and leading them to a summit running east and west. Along the north line and almost parallel with the summit I ran drains A and B. The main consists of 700 eight, 700 seven, 800 six, 800 five, and 600 four-inch tile to curve *a* in the plat; balance, threes. Laterals 10 to 22, have 400 four-inch tile each, although three would have been plenty large but there were not enough on hand. The sub-main has 250 fives; balance, fours. Drain A has 500 fives; balance, fours and B is fours.

The tile were shipped from Libby, Ill. I did not learn the exact price of the tile, but I know that work and tile did not amount to over eighteen dollars per acre. The work has given entire satisfaction and this, heretofore, almost worthless land, been converted into more productive soil than the highly valued sandy land lying alongside of it. As I said in the beginning of this article, there are thousands of acres of similar land that can be bought cheap, reclaimed and made valuable by the expenditure of from fifteen to eighteen dollars per acre in tile drainage. Who of your readers will avail themselves of this golden opportunity? Those wishing to find out more about this land may address Mr. J. F. Rauch, Secretary Board of Trade, St. Charles, Mo., who will gladly and cheerfully furnish the desired information. ADOLPH THIEL.

Baton Rouge, La. Drainage Eng'r.

As we rode along the highway we heard the frogs on our right and left, on lands that were being farmed, we said: 'What a want of drain tile and brains.'

Road Drainage.



DRAINING ROADS.

BY CHAS. C. BROWN, C. E.

Too much stress cannot be laid upon the proper drainage of a gravel road. As a great Canadian engineer and contractor says of railroads, there are three things necessary in building a gravel road; the first is to drain it, the second is to—drain it, the third—well, that is to drain it, too. Every foot of gravel road should be supplied with sufficient drainage facilities to carry off at once all water that may come to it, and leave nothing to sink into the road bed to soften and disintegrate it. The ditches on steep grades need often special attention, especially in clayey soils, to prevent undue cutting away and deepening of ditches, and subsequently injury to road bed. The drainage of the road when on a side hill is often a matter of considerable interest, and gives plenty of opportunity for display of engineering abilities in effecting complete drainage cheaply, and with as little danger to the road bed as possible. It may be well to state the general rule that the water should be carried through from the upper side of the road to the lower

as soon as possible, due consideration being given to the amount of water draining down to the road from extra flows, as against the expense of putting in cross drains, the facilities for getting rid of the water on the lower side without demand of pottery, etc. On long levels, especially when what slight slope there is, is from each direction into a basin, a special treatment is necessary, and it will be well sometimes to lay lines of drain tiling under the ditches on each side with sufficient capacity to carry the water (usually in small amounts in such cases) to a proper outlet.

INFLUENCE OF GOOD ROADS.

BY COL. ALBERT POPE.

The influence of good roads toward the development and increase in value of the agricultural regions will hardly be questioned.

The advantages of improvements are not confined to the proprietors or to those living immediately upon any road, but are shared by all who avail themselves of the increased facilities.

Agriculture is both directly and indirectly dependent, in a great degree, upon good roads for its success and rewards,

Directly, as these roads carry the production of the fields to the market, and bring to them in return their bulky and weighing materials, at a cost of labor which grows less as the roads become better.

Indirectly, as the cities and towns whose dense population and manufacturing industry makes them the best markets for farming produce are enabled to grow and extend themselves indefinitely, by roads alone, which supply the place of rivers, to the banks of which these great towns would otherwise be necessarily confined.

While, therefore, it might be an inex-

cusable waste of money to construct a costly road to connect two small towns which had little intercourse, it is equally wasteful, and is a much more frequent shortsightedness of economy, to leave unimproved, and almost in a state of nature, the communications between a great city and the interior region from which its daily subsistence is drawn, and into which its own manufactures and merchandise are conveyed.

The prosperity of any city depends largely upon the surrounding country, and the better the road facilities, the faster the country will grow in population and the more business the city will have in supplying their wants.

Some of the advantages thus to be attained have not long since been well summed up in a report of a committee of the English House of Commons:

"By the improvement of our roads every branch of our agricultural, commercial, and manufacturing industry would be materially benefited.

"Every article brought into market would be diminished in price, and the number of horses would be so much reduced, that by these and other retrenchments, the expense of millions [pounds sterling] would be annually saved to the public.

"The expense of repairing roads and the wear and tear of carriages and horses would be essentially diminished, and thousands of acres, the produce of which is now wasted in feeding unnecessary horses, would be devoted to the production of food for man.

"In short the public and private advantages which would result from effecting that great object, the improvement of our highways and turnpikes, are incalculable; though from their being spread over a wide surface and available in various ways, such advantages will not be so apparent as those derived from

other sources of improvement of a more restricted and less general nature."

It is always economy to spend enough to begin with to secure the best results, and it always costs less in the long run.

A good road should cost more to build than a poor one, but it is often the case that a poor road costs as much as a good one would. But even when a good one is more expensive, it will be easier and cheaper to keep in repair, and will last many years longer; while its advantages, and the savings to those who daily use it, will very much more than compensate them for the extra expense they have been put in the building.

TILE DRAINAGE OF ROADS.

All experience and observation tend in this direction and convince us that by the common roadmaster the importance of thorough drainage is not understood. The temporary expedient of a narrow and shallow ditch by the roadside, often filled with water, is a common and painful proof of the fact. His attempts at ridding the road of the surplus water is generally abortive, and the thought that it is practicable to relieve the subsoil of of excess moisture has never been entertained by him. Yet sound philosophy points out this as the key to the situation. Many experiments in this direction have met with an encouraging success, by the simple use of ordinary drain tile. Many persons who have had experience with highways drained by tile have given an account of the results, and the conclusions reached. In every instance, the verdict is in favor of tiling as being more economical, effective, and every way satisfactory than any other method practicable under the usual conditions of roadmaking in the country. One satisfactory plan is to lay a line of tile of ample size lengthwise of and along the center line of the roadbed, at a depth

great enough to draw the water from below the bottom of the open ditches by the road side. If this line be laid of sufficient depth to accomplish the object, and if it be filled over the tile with some porous or percolating substance, no doubt it would prove quite effective. This is said to dry the road soonest right on the line of travel, and to fit it for use sooner after rainfall than any other method. I have seen samples of road drained in this way that seemed to be all that could be desired. Mr Thomas Hooker, of Fairland, Iowa, was a pioneer in this mode of draining highways, and enthusiastic in recommending it. Others claim that a line of tile on each side of the roadway, a few feet within the side ditches is the better method. It is also claimed, and with reason, that the amount of travel, which passes over a given road has a great deal to do with the completeness with which under drainage effects it. Where roads are but little traveled, as in the case of farm roads and lanes used by a neighborhood, simple drainage by one line of tile lengthwise through low places, has proved sufficient without grading. When the travel is heavy, as over leading roads to towns and railroad stations, the case may be entirely different. When the entire width of the road becomes cut into ruts, and in wet weather puddled on the surface by the continued passage of teams in a clay soil, no water will pass through to the drains, and without an embankment and side ditches the road will grow worse. The under-drains will keep a good base upon which to build a road, but they will not take water from a puddled surface. On all such roads experience has proven that we need the combined action of under and surface drainage, together with continued oversight and care of the traveled surface. The surface of the road must be sufficiently crowning to throw off all

water possible, then under-draining at the sides will prevent the bottom from becoming saturated and soft. The surface should receive such care at times as is necessary to keep the surface crowning and to drain water from ruts that are sure to introduce themselves to all earth road surfaces. A line of tile at each side of the embankment seems to give the most perfect drainage. Let the lines be so located that the teams cannot drive directly over them, for their value for taking surface water depends on some part of the earth near the drain being left porous and free from the puddling effects of passing teams. It would be an easy matter to fully prove in various localities the advantages of each method separately, or, in bad places, to use both methods. If, also, there were added the use of gravel, broken stone, or other similar materials over all these drains in such places, it might prove a wise economy. Effectiveness and certainty are of great importance in such matters, and there would be no expense in trying all of these plans that would not be fully returned to the public.—*Mr. Richard.*

A DISAPPOINTED ENGINEER.

The importance of easy grades is fully recognized where thought has been given to the subject, but that we have been persistently regardless of its value goes without saying. I recall with bitterness the disregard of the pains and labor that I went to in locating an important country road, when I had taken care to fit it to side hills and to cross the lowest summits and get the easiest grades, making it a road full of gentle curves that had a scientific reason in them; a road that had unity from beginning to end. The commissioners came on and listened to the individual pleading that cow pastures should be placed on straight lines (although the cows themselves set

examples of easy roads that they traveled) and proceeded to straighten my road down valleys and up hills until its practical unity was destroyed and the line actually increased in length. The only satisfaction that remained to me was that in the woods, where they could not see the crooks, they followed contentedly over an easy graded path.—*E. E. Jordan.*

HOW HE SUCCEEDED.

BY MISS FARMER.

The dispatch read: "At 2 o'clock, P.M. yesterday, George Preston, of Berlin, was found dead in his own house. Cause—apoplexy."

So poor Uncle George was dead. He was not Harry's own uncle, but an uncle of his father, still Harry and his mother were quite saddened by the news of the poor, lonely old man's death.

It is needless to state that Harry was completely taken by surprise when the old man's will was read to find it read as follows: "I, George Preston, of the town of Berlin, County of Rock, being of sound mind and memory, and mindful of the uncertainties of human life, do make, publish, and declare this my last will and testament, in manner following—First, after the payment of my just debts and funeral expenses, I give, devise, and bequeath to my sister Mary's children each \$100. Second, I give, devise and bequeath to Harry Stafford, son of my deceased nephew James Stafford, all the rest, residue and remainder of my estate, both real and personal, for the reason that Harry Stafford being the only living relative who ever labored on a farm is, therefore, the only one with sufficient agricultural knowledge to conduct a farm.

In Witness Whereof, I have hereunto set my hand and seal this 6th day of October, 18—
 GEORGE PRESTON.

This singular will being finally proved,

Harry found himself the sole proprietor of a quarter section of land.

Early in January he moved out to the shabby and uninviting old house and was soon settled, with his good mother installed as housekeeper.

One of the first things he had done, although it did show some disrespect to the former owner, was to have auction bills printed and widely distributed, advertising the sale of all stock on hand.

"What is that fellow thinking of?" "That is all you can expect from a green hand," and similar comments were expressed concerning the enterprising Harry and his undertakings. But his few months' experience on a well conducted farm led him to this act. He did not deem it good policy to run a farm with a number of scrawny horses and scrub cows, but would use the proceeds of the sale towards the purchase of two or three good, sound horses and a few thorough-bred cattle.

In the meantime, he employed a carpenter for a few days to make some much needed repairs on the farm buildings that they might be a little more presentable in appearance as well as more comfortable.

The net proceeds of the sale turned out to be some less than our young farmer had expected. However, it was found to be enough to purchase two good-sized stylish looking horses, six cows and two brood sows. Although the number of his stock was not very large, he felt the foundation was a substantial one and he would increase the number as he saw fit.

Living one mile from the village of Berlin, Harry and his mother attended religious services there every Sabbath, and Harry also was regularly present at the Farmers' Club and the Young People's Literary Society.

He now took advantage of the good

sleighting by hauling home loads of tile preparatory to the draining of a forty-acre marsh on his land. His neighbors had informed him that his Uncle had usually obtained enough marsh hay from that piece of land to pay taxes on it.

"Now," said Harry and his face plainly disclosed the energy and zeal of his nature, "I am going to drain that marsh in the spring, even if it will be necessary to wait one year or more for a better house and barn."

His mother thought that his plans were plausible.

"You see," he continued, "I have the five hundred dollars saved while keeping books, and then there are the seven hundred dollars left for me after all of Uncle's debts, etc., were paid, so there is enough with which to do it and I am positive it will be money well spent."

Thus time sped rapidly on, and the warm winds and the singing birds announced the departure of wintry blasts and the return of spring.

By May 1st Harry was ready to commence operations on his marsh. He had read all papers and works on drainage that he could find and had also visited a farmer living ten miles distant who had done a considerable amount of tiling and was, therefore, able to impart useful information on the subject.

Four men had been hired to do the ditching while an extra hand, a man who had experience in laying tile was engaged to come certain days to put in the tile. The other work of the farm kept Harry very busily employed. Although with much more care and physical labor than he had been accustomed to, his health remained in excellent condition, as also did the health of his mother.

By the last of August, the work of draining the forty-acre lot was completed

and the ground was in a condition fit to be plowed.

Harry now sat down to foot up expenses to see what the actual cost had been. There were the tile, the ditching tools, four men working daily, one more man some days, a girl to help in the house; total cost, nine hundred dollars.

"There," said Harry as he lay down on the lounge for his noon rest. "I wonder how long it will take to make up that amount on that piece of land."

Winter had again spread a white mantle over the earth, and Harry and his mother were happy to accept an invitation to spend Christmas with the Schumacher family with whom Harry had passed the first summer he spent on a farm. They found the whole family as jolly and happy as usual. Linnie, the daughter, had grown a little taller and even more handsome than formerly, at least so Harry thought. After a delightful visit, on their return home, Harry asked his mother if she would object to having the fair Linnie as a daughter.

"No, my son," she answered. "Your happiness is mine and I fully believe her to be a true, capable girl, worthy of you and that you will be mutually happy. May God bless you."

Harry found himself as busy teaming this winter as the previous one, for, on account of the poor condition of their dwelling house, he deemed it the wisest plan to make preparations for the erection of a new one in the spring. So he brought home great loads of lumber which were piled ready for the use of the builders.

Another summer with the usual toils and pleasures had come and gone. Then came September, an eventful month to Harry and one that he would frequently recall to mind in later days. First, he had harvested the wheat on the much

discussed and much worked forty-acre lot that he had drained the preceding summer. His wheat averaged twenty-six bushels per acre, making a total of 1,040 bushels which he shipped at once, and for which he received at 88 cents per bushel, \$915.20.

"The drainage paid for in one year!" exclaimed Harry. "Well that does beat all my highest hopes and expectations."

His neighbors who assisted at thrashing time were decided converts to the advantages obtained from systematic draining. To say that Harry felt well paid is to express it very mildly.

The new house was now ready for occupancy, so about the middle of the month a week was spent in settling in the new domicile. How fresh, clean and inviting a new house is! Mrs. Stafford now had a sunny place in the spacious bay window for her plants, and oh, the closets! What a comfort, and how well appreciated after the experience in the house they had just deserted. But the great event of the month took place on a sunny Wednesday afternoon the last of the month, when a large gathering of friends at the Schumacher residence witnessed two hearts made one and when Harry kissed a sweet face beneath orange blossoms and called her his wife.

After a sumptuous wedding feast, Mr. and Mrs. Harry Stafford left on the evening train so spend a short time in visiting numerous relatives and friends, after which they established themselves in their new home where Mother Stafford fondly greeted them.

As years rolled on, Harry had made many improvements on his farm which not only lessened the toils and labors of a farm life, but increased the value of his estate, and he is now a wealthy, influential farmer having a robust body, an intelligent mind and a happy home.

[CONCLUDED].

Agricultural.

'Long in Sugar-Makin' Time.

Ever' feller has some season that his feelin's likes the best—

Maybe summer, maybe winter—that he thinks beats all the rest;

But the days that makes my droopin' spirits jest git up and climb

Air the dyin' days uv winter, 'long in sugar-makin' time.

Then the little birds is singin', tunin' up their little throats,

Thinkin' uv the comin' harvest, uv the corn, and wheat and oats,

An' the tinklin' uv the sheep-bells, with the ring-in' cow-bells' chime,

In the dyin' days uv winter, long in sugar-makin' time.

Then the little lambs is playin' an' a caperin' around,

An' the first blue Johnny-jump-ups is a peepin' through the ground,

An' the thawed-out branch flows happy, kinder singin' in a rhyme,

In the dyin' days uv winter, 'long in sugar-makin' time.

Ever'thing, both dead an' livin', twixt the earth an' sky above,

Seems so smilin' an' so pleasin', like it all had fell in love;

So, fur me, this side uv heaven, there can't be no fairer clime

Than the dyin' days uv winter, 'long in sugar-makin' time.

—Fred Leigh Pochin.

IRRIGATION FOR STRAWBERRIES.

I put up an extensive plant in Illinois, for the purpose of trying irrigation on strawberries and other things. My well, 104 feet deep, inexhaustable, was on the highest point on my place. The water was pumped up by wind power into large tanks, where it was allowed to become of the warmth of the air before using. It was conveyed by pipes to the strawberry beds, and was applied both by running it between the rows and by showering overhead. The results in either case were not nearly so good as I had anticipated, but very much the better where the water was applied between the rows. Where it was showered on the plants from above

there was to much disease—rusts and blights. Where run between the rows, there was but little more of these than on plants not irrigated. It is true, I got a much larger and longer season of fruit from the irrigated plants.

And here comes in a point that was quite mysterious to me at first, but I believe I have it studied out correctly now. It is this: One season I was irrigating some plants that were roofed over to prevent their tops, foliage from wet. It was a season when there seemed to be fully sufficient rain for strawberries. The surplus water from the above plants ran down quite freely into a bed of strawberries just below. Those where the water reached them made an immense crop of very large berries. My explanation of this is, that the pressure of the atmosphere—state of the barometer, as we term it—has a great deal to do with the size of strawberries and most other fruits. When the barometer is low, therefore the air pressure less, the berries swell out big. When the air pressure is above normal, they cannot do this.

I irrigated strawberries one season when it was very dry. The berries on the irrigated plants were but very little larger than on those where water was not used, though there was many more of them. Toward the end of the season there came a light sprinkle of rain with quite a low barometer for a time, when the berries on the irrigated patch swelled out wonderfully large, while it seemed to injure rather than help those not irrigated. Therefore it follows that we can pump the water in, but we cannot pump up the low barometer to give us big berries.

Strawberries and raspberries are irrigated here in California by flowing the water in furrows between the rows; the plants grow on slight ridges, and the secret of their wonderful and long-con-

tinued healthy productiveness here is that their foliage is seldom wet except by dews, and these are generally dissipated in the morning while the sun is obscured by a fog; therefore, their foliage is, as a rule, very healthy. In fact, the tender, European strawberries, that are generally worthless east from foliage disease, do finely here. And one other thing, the reasons for which I have not studied out as yet, the berries here swell out as they do east under a very low barometer, no odds how fair and dry the weather may be.

The strawberries seem to be peculiarly adapted to climates with but very little rainfall, in case their roots can have moisture enough. Therefore, the proper way of irrigating them is first by running water between the rows; second, and by far the best, subirrigation, combined with thorough underdrainage. This seems best for nearly every tree or plant on which it has been tried, not only because it gives the growing plant, every moment of its life, exactly the right amount of moisture for the best results, no more and no less, but also because it prevents, so far as possible, moisture in contact with the foliage, entirely so in rainless summer climates like California; it also permits of the surface of the soil being dry, for my experiments in Illinois proved that the near presence of moisture (in the furrows) generated foliage disease. I had said in my articles that subirrigation combined with underdrainage was undoubtedly the best for all climates. It is very expensive in the start, but if put in right, I think it would pay better than buying United States five-per-cent bonds at twenty cents on the dollar. If the water can be had and brought to the land cheaply, surface irrigation will pay well, applied to strawberries and many other crops all over the prairie states and nearly everywhere else,

but subirrigation would pay an hundredfold better.—*D. B. Weir, in Farm and Fireside.*

Miscellaneous.

A Quarrel.

There's a knowing little proverb
From the sunny land of Spain.
But in northland as in southland
Is its meaning clear and plain.
Lock it up within your heart,
Neither lose or lend it,—
Two it takes to make a quarrel:
One can always end it.

Try it well in every way
Still you'll find it true.
In a fight without a foe,
Pray what can you do?
If the wrath is yours alone
Soon you will expend it.
Two it takes to make a quarrel:
One can always end it.

Let's suppose that both are wroth,
And the strife begun,
If one voice shall cry for peace
Soon it will be done.
If but one shall span the breach
He will quickly mend it.
Two it takes to make a quarrel:
One can always end it.

Selected.

TALMAGE SAYS "SLEEP."

T. De Witt Talmage says: "There is not one man or woman in ten thousand who can afford to do without seven or eight hours' sleep. All those stories written about great men and women who slept only three or four hours a night, make very interesting reading, but I tell you, my readers, no man or woman ever yet kept healthy in body and mind for a number of years with less than seven hours' sleep.

"Americans need more sleep than they are getting. This lack makes them so nervous and the insane asylum so populous. If you can get to bed early, then rise early. If you cannot get to bed till late, then rise late. It may be as Christian for one man to rise at eight as it is for another to rise at five. I counsel my readers to get up when they are rested. But let the rousing bell be rung at least thirty minutes before your public ap-

pearance. Physicians say that a sudden jump out of bed gives irregular motion to the pulse. It takes hours to get over a too sudden rising. Give us time, after you call us, to roll over, gaze at the world full in the face and look before we leap."

WOMEN WHO PLEASE MEN.

Man, in many respects, is a peculiar animal, says a writer in *The Ladies Home Journal* for March. He is easily persuaded by a woman but he cannot be driven. A woman who seeks a man's admiration and says by her demeanor or by suggestion "Admire my beauty or my brightness," is the woman from whom a man will turn quicker than from anything else. A woman always makes a mistake when she attempts to force her beauty or her talents upon a man—or upon another woman for that matter. A woman who seeks admiration always reminds me of a hollyhock, conspicuous and flaunting and anxious to be seen. Now, men never care for hollyhocks. It is not man's favorite flower. The violet, or a half-blown rose to more to his taste. Go where there is a company of well-dressed men in evening costume, with boutonnieres, and, if in season, the violet and the rose will be found in the lapel of nearly every coat. And what is true with men of flowers, is true of what he always associates with them—women. A man likes to discover a violet or rose; he wants to find out its charm for himself; he doesn't wish a directory to aid him in this, and he is very contemptuous of the woman who here, there and everywhere asks his admiration. The women who are popular with men are the women who impress them with their womanliness, and by this is meant that subtle something that says, "I do not thrust myself forward, but perhaps if you find me you may like me." Men have always liked voyages of discovery and they like to seek the ideal woman, and not have her thrust her greatness upon them.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

*J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.*

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten " " ".....	8 00
Single Copies.....	10
Send for rates for larger clubs.	

It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers.
It is the best possible medium for those having
tile machinery, brick machinery, kilns, fire brick,
engines, ditchers, clays, tile yards or second-hand
machines for sale, to advertise in.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1.
 Twelve lines Nonpareil type make one inch.
 Liberal discount for longer time and largerspace.
 Transient advertisements must be paid for in advance.
 For large advertisements address the publisher for terms.

For several years there has been an effort to secure an amendment of the Lien Laws of several States, so as to include drain tile, used in the underdrainage of the land. Why not? There is not an improvement of a permanent character that adds more to the prosperity of the land owner than that of underdrainage.

But the benefits derived from the tile does not make men honest. There are a great many men who would rob their parents of honest dues, however prosperous. There are men who will buy tile and lay them and get an immediate

It is quite generally agreed that laborers are entitled to the protection afforded by lien laws. More, contractors and lumber men are also protected by lien laws. Then, why not include drain tile, used in the improvement of the farm?

For some reason law makers have been slow to respond to the demands of tile manufacturers. But the conviction is becoming more general that such protection should be afforded, and it will be in the near future, and rightfully too.

The condition of the streets and roads leading to many of our towns and cities at this writing is simply horrible. Much is being said about improving them. Some advocate the use of gravel and the use of brick for pavements is being quite generally discussed, and contracted for. But no improvement is likely to be permanent and satisfactory unless provision is made to insure a firm roadbed. To do this there is no surer or less costly method of doing this than by putting down underdrains of tile. Two lines of drains, one on each side of the roadway or street—two or three feet inside of the open or storm water ditch (if there is one). These drains should be laid two or more feet in depth below the road surface. Such drains should have free outlets at all convenient points. They will carry off all seep water and prevent the water, coming from the ground on the sides, from soaking on the road or street.

Where such drains are put in, half of the gravel otherwise required to make a good street will be found sufficient,

which will lessen the cost of the improvement and at the same time insure the permanency of the street or roadway.

If the foundation is soft and springy, no covering on top will be satisfactory in the end.

In many sections of Illinois and Iowa such underdrains, as above described, are the only improvement made other than the grading, and they are proving very satisfactory. Such roadways get a little muddy on the surface but that is all. A reasonable, good load may be drawn over them at any season of the year.

From careful observation, we are fully convinced that no improvement for the cost will give the same satisfactory return, in the bettering of the condition of our highways, as that of tile drains, if the work is well done.

WHY DON'T YOU?

If you want to sell your tile factory or machinery of any kind, or if you need experienced help, or if you want a position as superintendent, or as a burner, or other employment in a tile works—or if you want to buy second-hand tile machinery of any kind, why don't you advertise in the "Wants and For Sale" column of the DRAINAGE JOURNAL?

THE LITTLE BROWNIES.

The Brownie Book published by E. M. Freese & Co., the well known machine manufacturers, is entertaining, and a unique method of advertising—the "catch the eye" kind of advertising, in which they tell us that they have another kind of book that they will forward on application. Address E. M. Freese & Co., Plymouth, Ohio.

On third page of cover see the advertisement of the New Bremen Machine Co., and then request them through the mail to send you a circular, which will

fully explain the many important advantages developed in the construction of the Titus Steam Press Tile and Brick Machine.

Literary Notice.

The late Peter Henderson's only daughter, Mrs. Isobel Henderson Floyd, has written a charming little serial entitled "Uncle Aaron," which is to be published in *Seed-Time and Harvest*, beginning with the March issue. The publishers offer to send the three numbers containing this "pathetic life picture" for only 10 cents, or the Journal a full year without premium for 30 cents. Address *Seed-Time and Harvest*, La Plume, Pa.

THE C. H. & D.

(Cincinnati, Hamilton & Dayton)

AND

MONON ROUTE

(Louisville, New Albany & Chicago).

The equipment of this line is not surpassed by any road in the country.

All trains are vestibuled from the engine to the parlor cars. They are run through solid without change from Chicago to Indianapolis to Cincinnati.

The day train known as the "Velvet" consists of a Parlor Car, Ladies' Car, Smoking Car and Dining Car. This train leaves Dearborn Station, Chicago, at 9:30 a. m., arrives at Indianapolis at 3:20 p. m., and at Cincinnati at 6:45 p. m.

Hereafter the night train known as the "Electric" will consist of a Compartment Sleeping Car, a regular Sleeper, a Ladies' Car, with an additional Sleeper for the accommodation of Indianapolis passengers.

The entire outfit has been built by Pullman expressly for this line, and is simply the best. E. O. McCORMICK,

Gen'l Passenger and Ticket Agt.,

Cincinnati, Hamilton & Dayton R. R.,
JAMES BARKER, CINCINNATI, O.

General Passenger Agent,

Monon Route,

CHICAGO, ILL.

To accommodate persons desiring to visit the great wheat and corn lands of the West, the Big Four Route (C. C. C. & St. L. Ry.) has established through car lines, equipped with Wagner palace sleeping and reclining chair cars, to St. Louis and Peoria, at which point direct connections are made in Union Depots with through cars for all Western and Pacific Coast points. Now is the time to visit this great and rapidly growing section of our country, and in order to thoroughly enjoy the trip ask for tickets via the Big Four Route.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.
GEO. L. PEARCE, Guineys, Va.

WANTED.

A good drain tile burner. Must come well recommended.
J. W. WALKER,
Morganfield, Ky.

FOR SALE.

One Junior Westinghouse Engine, 15 h. p. Has been used for six weeks running a fan. For particulars and price, address J. W. PENFIELD & SON, 75 Drying Cars—smooth rolls.
Willoughby, Ohio.

FOR SALE OR TRADE.

One Terre Haute Tile Machine, new.
One Penfield Plunge, steampower.
One Eureka Mill.
These machines can be bought very low. Address
J. M. HEDGES, Terre Haute, Ind.

WANTED.

Second-hand steampower Tile Mill in good repair. Must be run with thirteen h. p. engine.
A. BOYD,
Montpelier, Ind.

FOR SALE.

Two New Bremen Tile Machines, one of which has a screen; is a 2 h. p. Size of dies, 2 to 8 in. The other is a 3 h. p.; size of dies from 2 to 12-inch. For prices, address
F. M. GARDNER,
New California, Ohio.

WANTED SITUATION.

As foreman of brick or tile works. paving brick preferred. Have had experience and can give good reference. Address
THOS. H. TRAINOR,
3 t p. 2000 N. Adams St., Peoria, Ill.

FOR SALE.

A Brewer-Tiffany Tile Mill in good repair, with dies from 3 to 10-inch, and side-cut brick die, all in good shape. Address
FOWLER TILE WORKS,
Fowler, Ind.

WANTED.

A Tile Table adapted to 6-inch tile, one that will cut two tile at once and one that will run easy and support a soft tile in good shape. A second-hand Table will do if in good repair and cheap.
Address
FOWLER TILE WORKS,
Fowler, Ind.

FOR SALE.

A small, dry land ditching or dredging machine, ½-yard size of the Marion make. Can offer it at a reasonable figure. Original price about \$3,000. Can make it a bargain to some one. Will take a part in trade. Address
ELLIOTT, BLAICH & Co.,
Marion, Ohio.

FOR SALE.

One Brewer Tile Machine with dies from 3 to 10-inch. One Wallace Clay Crusher. Both machines are complete and almost as good as new. These machines will be sold very low. For price, etc., address,
M. J. LEE,
Crawfordsville, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN,
Portland, Indiana.

FOR SALE.

1 ten h. p. Traction Engine,
1 Eureka Tile Mill.
1 Clay Crusher—smooth rolls.
75 Drying Cars—for tile.
For further information, address,
W. D. COVERT, Administrator,
3 t. Franklin, Ind.

FOR LEASE.

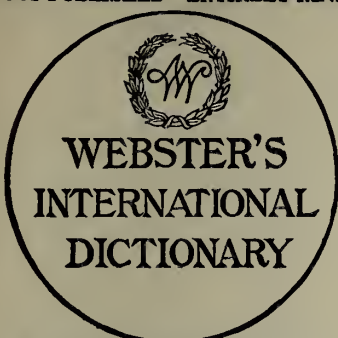
Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap.
F. C. DEVENNORF, Receiver,
244 South Water Street, Chicago, Ill.

Hubert J. McMillan & Co. St. Louis, Mo.
Artistic Metal Work.
Grates, Iron and Wire Office-work.
Railings, Crestings, Nettings, etc.
Everlasting Cemetery FENCES.
Shipped everywhere. Accurately made.
Write for Catalogue and Estimate.

BEATTY'S ORGANS, PIANOS
\$35 up. Write for Catalogue. Address Dan'l F. Beatty, Washington, N. J.

THE NEW WEBSTER

JUST PUBLISHED—ENTIRELY NEW.



A GRAND INVESTMENT

for the Family, the School, or the Library.
Revision has been in progress for over 10 Years.
More than 100 editorial laborers employed.
\$300,000 expended before first copy was printed.
Critical examination invited. **Get the Best.**
Sold by all Booksellers. Illustrated pamphlet free.
G. & C. MERRIAM & CO., Publishers,
Springfield, Mass., U. S. A.

Caution!—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

For 12c. In order to introduce my Seeds everywhere, I will mail free upon receipt of 12c. one package of earliest Radish, Lettuce, Melon, Tomato, and 3 packages Choice Flower Seeds in all 7 pkgs. listed nowhere in America under 40c. 100-page Seed Catalogue 5c.
JOHN A. SALZER, La Crosse, Wis.

CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitrified Stone Sewer Pipe we Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,

Cincinnati, O.

PATENTS THOMAS P. SIMPSON, Washington, D. C. No attorney's fee until Patent obtained. Write for Inventor's Guide.



**STRONG,
WELL-BUILT
SERVICABLE**

STEAM ENGINES

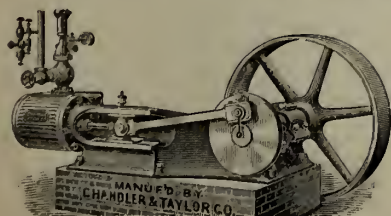
12 TO 80 HORSE POWER.

Adapted to Heavy, Continuous Work.

Every Engine Tested Under Full Load.

For Descriptive Circulars, address

CHANDLER & TAYLOR CO., Indianapolis, Ind.



**BIG
4
ROUTE**

The Shortest and most
Direct Route

East, West,
North, South.

Solid Vestibule Trains,

CONSISTING OF

The FINEST COACHES, PARLOR, RE-
CLINING CHAIR, CAFE and DIN-
ING CARS; WAGNER COM-
PARTMENT, BUFFET and
STANDARD SLEEP-
ING CARS.

Heated with Steam and Lighted
by Electricity,

FORMING

The FINEST TRAINS in AMERICA or
THE WORLD.

Its SUPERB TRACK and UNRIVALED MACHINERY
and EQUIPMENT permit the HIGHEST SPEED with
PERFECT SAFETY.

It is the only line which lands its passengers at
the GRAND CENTRAL DEPOT in the heart of the
great city of NEW YORK, which is an advantage of
NEARLY TWO HOURS IN TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others,
passing through the famous CITY OF PULLMAN,
along the LAKE FRONT, and the far-famed MICH-
IGAN AVENUE BOULEVARD, in full view of the
finest RESIDENCES and PUBLIC BUILDINGS. In
fact, its Connections and TERMINAL FACILITIES at
all points are superior to those of any other line.

Its trains enter the Central Union Station, CIN-
CINNATI; the Union Depots, CLEVELAND, BUF-
FALO and ALBANY; the Grand Central, NEW
YORK; the Boston and Albany, BOSTON; the
Union Depot, ST. LOUIS; the Union Depot,
PEORIA; the Great Central Depot, CHICAGO;
the Union Station, INDIANAPOLIS, and numerous
others in the vast territory it traverses between the
MISSISSIPPI RIVER on the west; the OHIO RIVER
on the south; the GREAT LAKES on the north,
and the principal SEA-BOARD cities in the east.

The Indianapolis Offices of this great line are
located at

**No. 1 East Washington Street,
138 South Illinois Street,**

and the UNION STATION, where tickets can be pro-
cured to all parts of the UNITED STATES and
CANADA and MEXICO, at the lowest current rates,
and full information as to routes, conditions, con-
nections, etc., etc.

OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN,
Gen'l Passenger Agt.

H. M. BRONSON,
Ass't Gen'l Passenger Agent
Indianapolis, Ind.

RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental
Designs, Paving Tile, etc.

BRICK MAKERS' SUPPLIES.

Tempering Wheels, Trucks, Moulds, Barrows, etc.

Send for circulars.

C. W. RAYMOND & CO.,

DAYTON, OHIO.



If you are thinking of building a house you ought to buy the new
book, Palliser's American Architecture, or every man a
complete builder, prepared by Palliser, Palliser & Co., the well
known architects.

There is not a Builder or any one intending to Build or otherwise
interested that can afford to be without it. It is a practical work and
everybody buys it. The best, cheapest and most popular work ever
issued on Building. Nearly four hundred drawings. A \$6 book in
size and style, but we have determined to make it meet the popular
demand, to suit the times, so that it can be easily reached by all.

This book contains 104 pages 11 x 14 inches in size, and consists of
large 8 x 12 plate pages giving plans, elevations, perspective views,
descriptions, owners' names, actual cost of construction, no guess
work, and instructions How to Build 20 Cottages, Villas,
Double Houses, Brick Block Houses, suitable for city suburbs, town
and country, houses for the farm and workmen's homes for all
sections of the country, and costings from \$300 to \$6,500; also Barns,
Stables, School House, Town Hall, Churches, and other public
buildings, together with specifications, form of contract, and a large
amount of information on the erection of buildings, selection of site,
employment of Architects. It is worth \$5.00 to any one, but I will
send it in paper cover by mail postpaid on receipt of \$1.00; bound in
cloth, \$2.00. Address all orders to J. S. GILLVIE, Publisher,
P. O. Box 2767. 57 Rose St., New York.

The
J. D. & W. Ry.



Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.00 pm. (daily.)
Ar Decatur	2.45 pm.	3.50 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.10 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin Bluffs, and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, City Ticket Agent.
JNO. S. LAZARUS, General Fr't and Tkt Agt.

MONON ROUTE

LOUISVILLE, NEW ALBANY & CHICAGO RY.

LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.
Arrive in Chicago 2.30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily..... 11:10 a. m.
Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.
Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday..... 11:55 p. m.
Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily..... 9:55 a. m.
Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.
Arrive in Indianapolis 3:55 a. m.

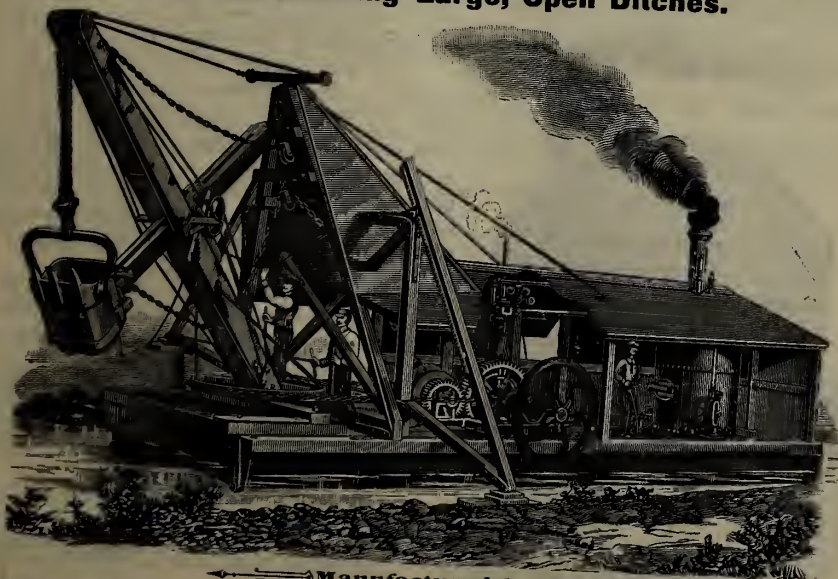
Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.

I. D. BALDWIN, D. P. A., Indianapolis.
JAS. BARKER, G. P. A., Chicago.

The Dredge Ditcher.

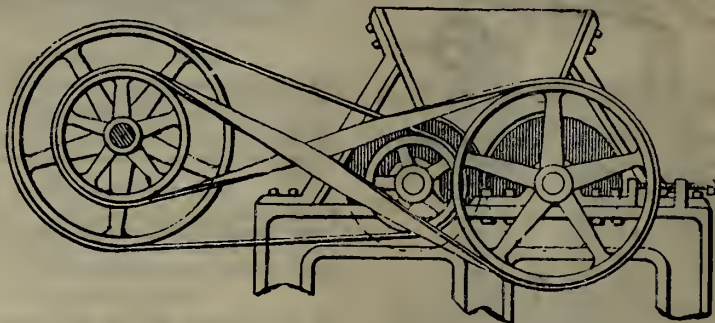
For Constructing Large, Open Ditches.



Manufactured by
MARION STEAM SHOVEL CO., - - **MARION, OHIO.**

THE Crusher and Disintegrator.

PATENT APPLIED FOR.



The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others, in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

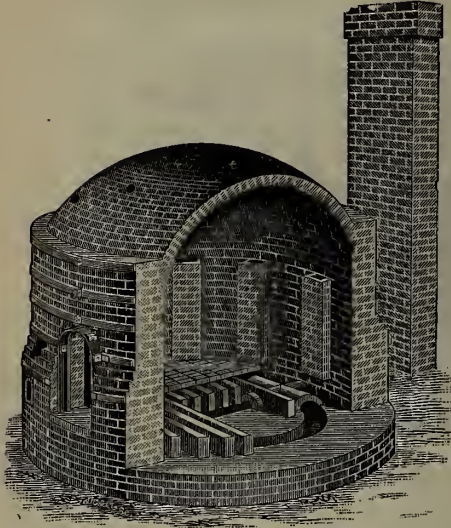
BOX 246, AYLMEER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.



"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT+LEADS+THE+WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

÷ New and Improved Brick and Tile Kiln ÷

PATENTED JULY 31, 1883.

This Kiln is offered to the Brick and Tile makers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

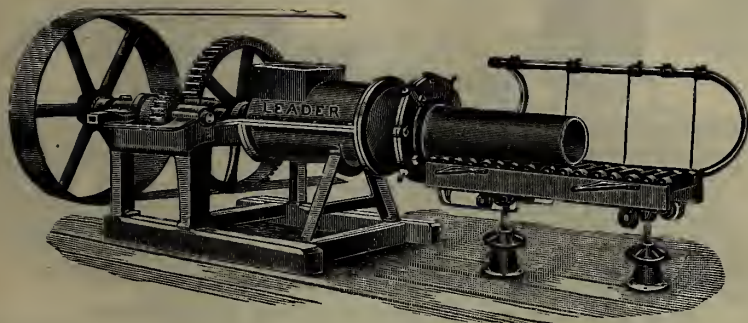
The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



J. B. GRAWCOCK, Churubusco, Ind.

Advertisements.

Brown-Frazier Manufacturing Co.,
PORTLAND, INDIANA,
—MANUFACTURERS OF—
Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,
Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS
FOR
CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



SECTION OF CONVEYOR.

ELEVATORS
FOR TILE,
BRICK,
PACKAGES, ETC.

Roller & Detachable
CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

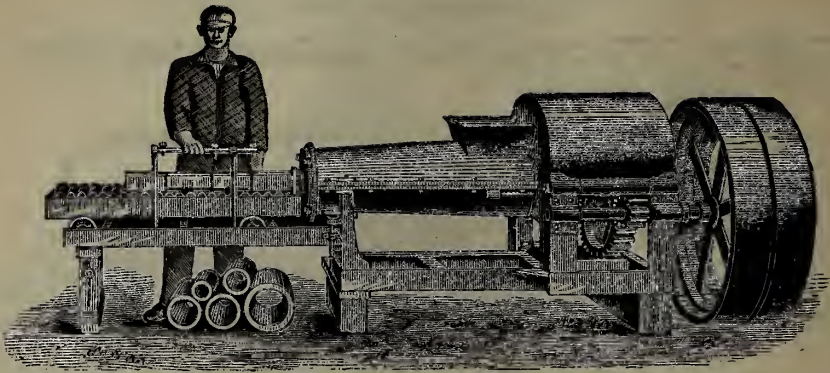
ADDRESS

The Jeffrey Manufacturing Co.,

112 East First Avenue,
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Brick & Tile Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1883; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

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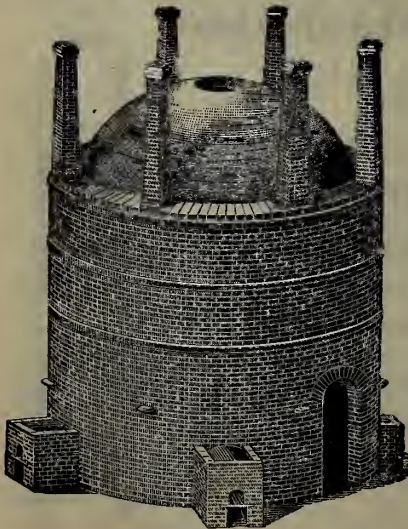
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

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A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

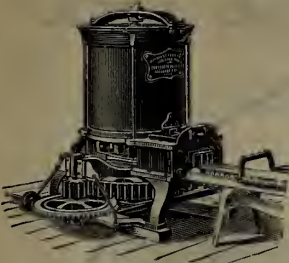
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

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(No. 2 E h.p. Machine.)

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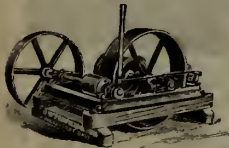
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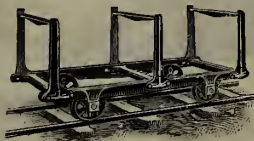


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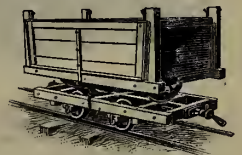
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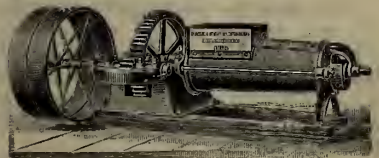
(Clay Car.)

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Willoughby,
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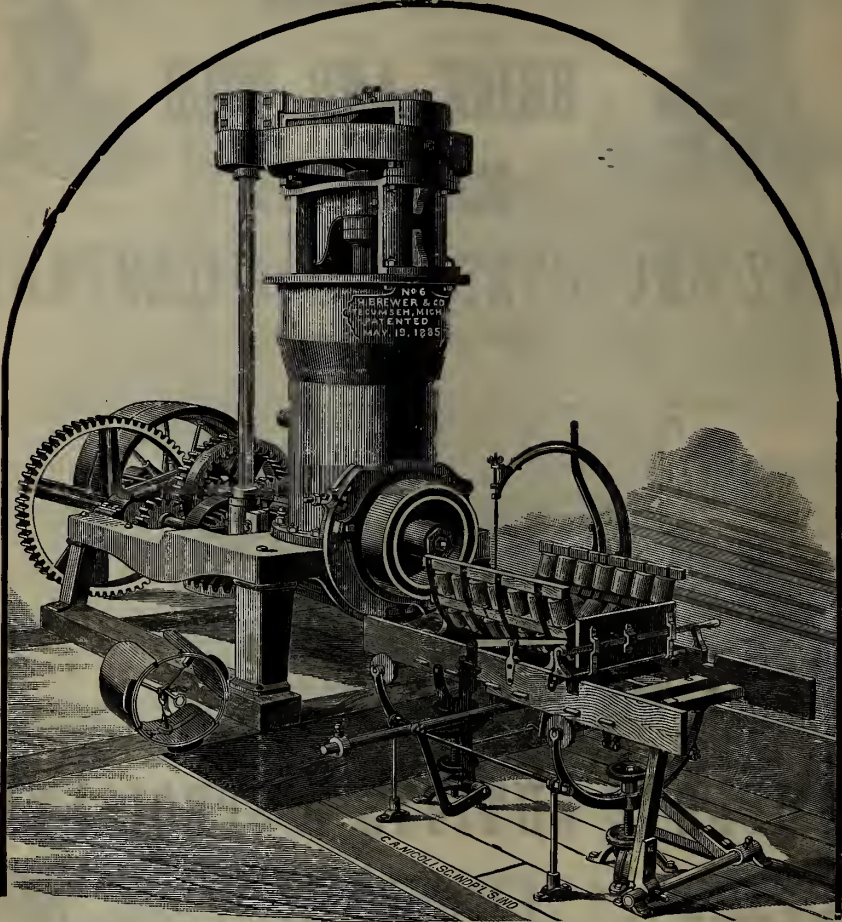


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(No. 7 Pug Mill.)

H. BREWER & CO.



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Yours Truly, M. J. LEE.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machinery.

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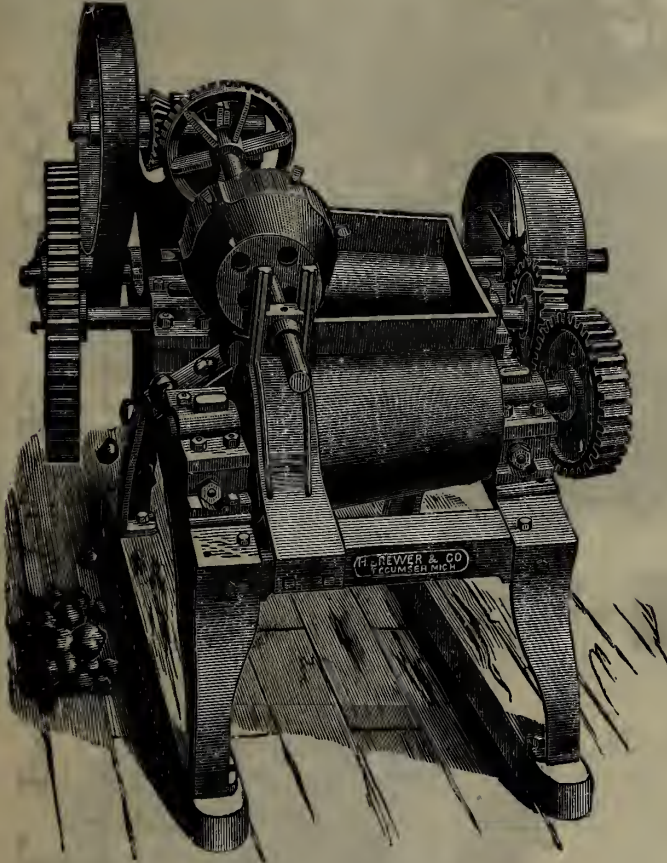
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The above Company are using four different machines.

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The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

PATENTED MARCH 3, 1885.

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The following are among the advantages claimed for this form of construction:

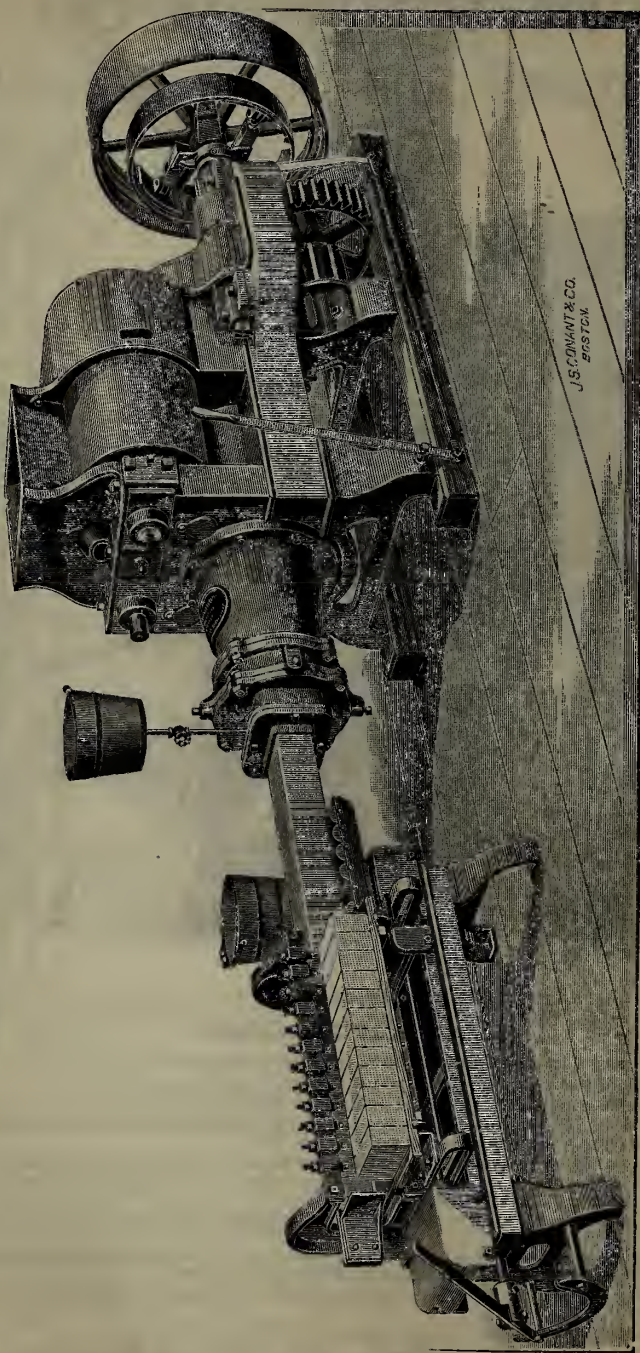
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
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TRANSIT LEVEL



FIG. 11.

FOR THE USE OF

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The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

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The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and 2½ in my catalogue, the price would be \$60.00.

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My DAISY LEVEL patented April 22, 1864, is the Cheapest Level made with the same accuracy for drainage purposes.

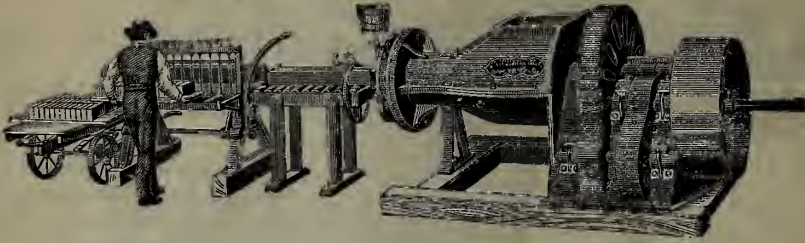
T. F. RANDOLPH,
Surveyors' and Engineers' Instruments,

51 West Fourth Street, Room 31.

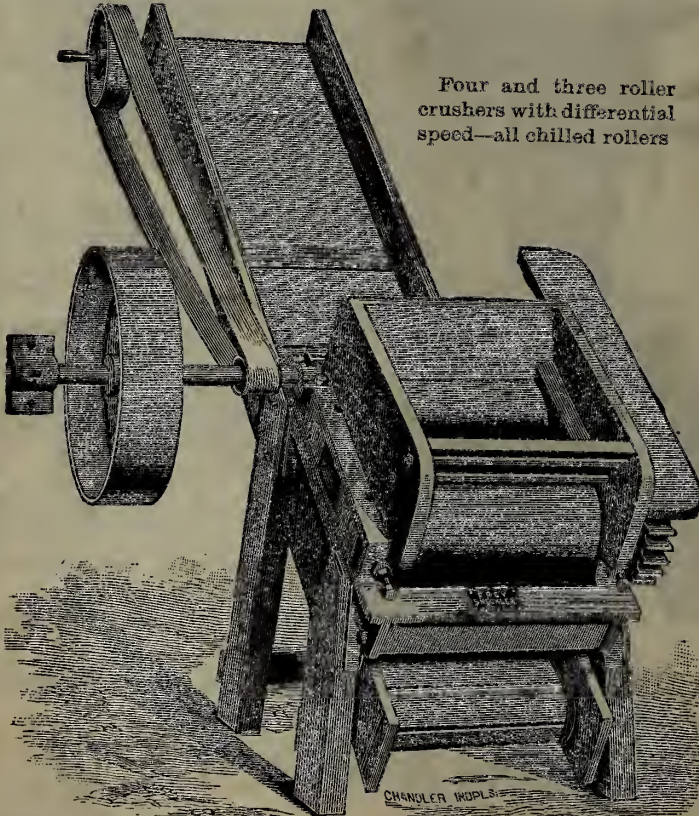
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The Centennial—the best clay mixer.
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crushers with differential
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Six Different Brick Machines; four Different Tile Machines
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Brick Moulds, Steam Pipes, Brass Goods, Etc.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.

We make thirteen different patterns of Roller Clay Crushers.

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THE FREY-SHECKLER CO., - Bucyrus, Ohio, U.S.A.

BRICK AND TILE MACHINERY.

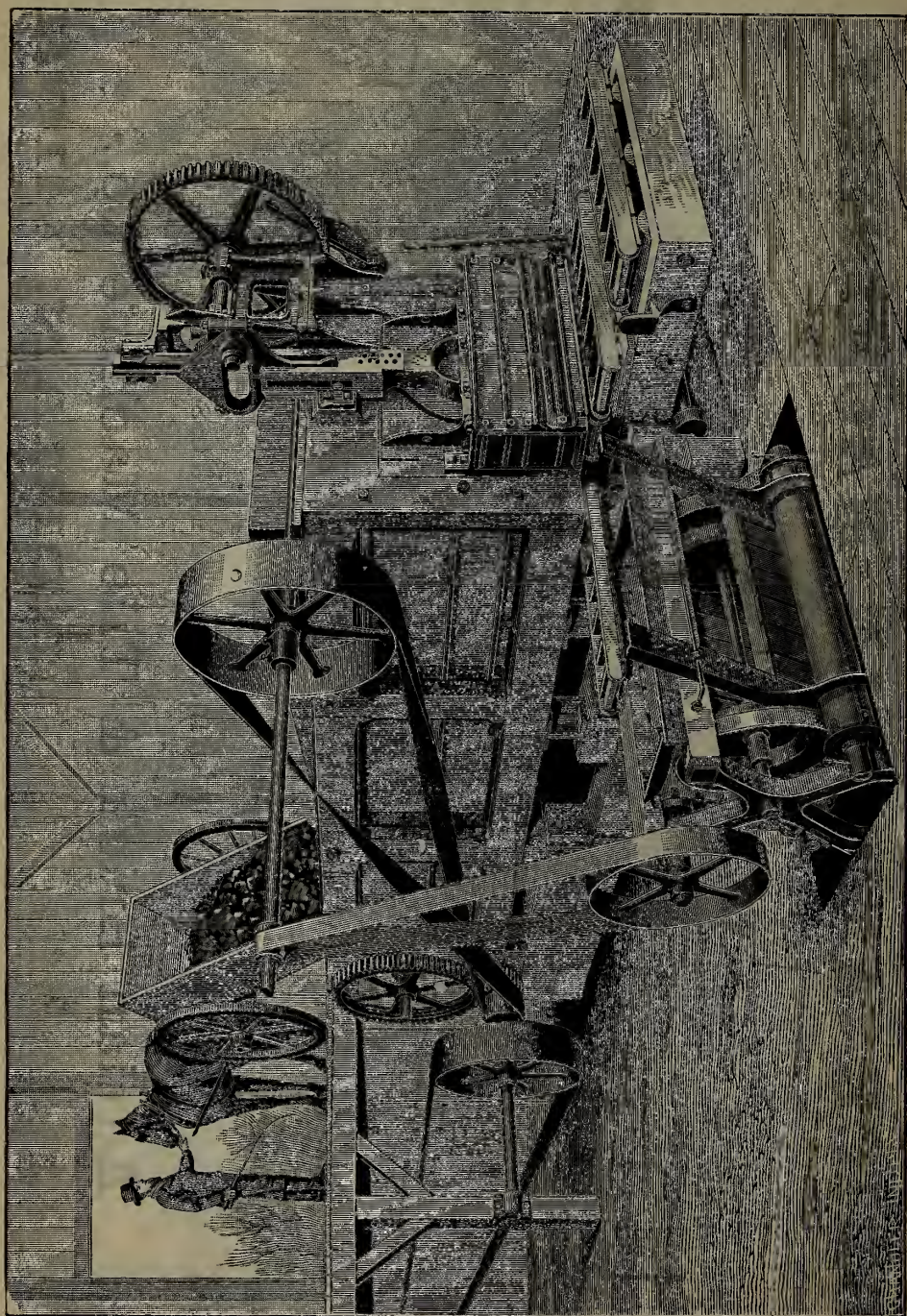


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specially adapted to cutting paving brick.

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ADRIAN, MICH.

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It has the largest tempering capacity of any machine on the market.

All brick made have clean, smooth surfaces and sharp corners.

It works the clay stiff enough to make the finest Stock Brick.

Our Mould Sander, shown in cut, has taken the lead of all machines for this purpose. There is no place for the moulds to catch and cause delays. It will not spill or waste any sand. It is easily and quickly adjusted to any size mould.

NOTICE:—A. H. Newton, of Cohoes, N. Y., claim our machine is an infringement on patent owned by them, and that persons using our machines will be prosecuted. As to this we would say, that we do not infringe said patents; that we have put our machines on the market only after a careful investigation to ascertain exactly what our rights are in the premises, and, being fully satisfied of our rights, we are prepared to protect our customers and Patents No. 397,274, of Feb. 5, 1889.

We are prepared to erect complete plants of any desired capacity and keep in stock a full line of **Brick Machines, Pug Mills, Disintegrators, Mould Sanders, Clay Cars and Drums.**

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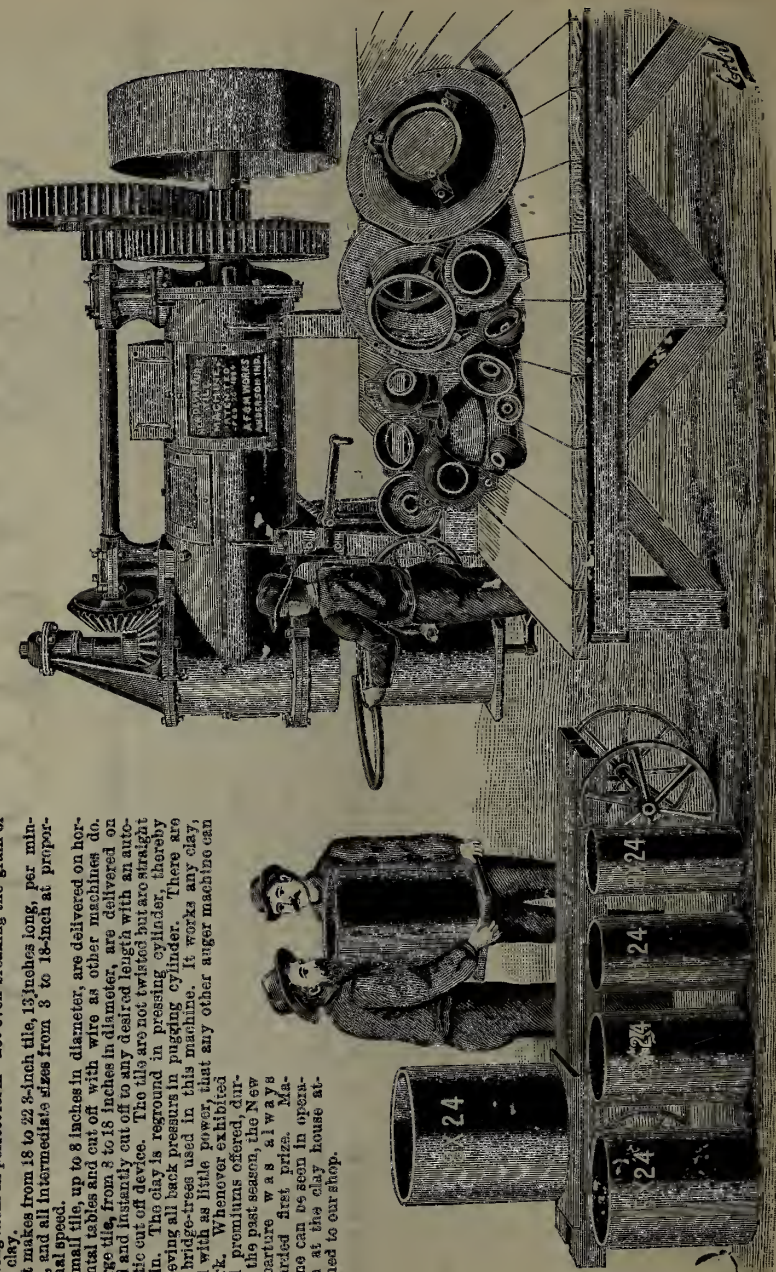
INDIANAPOLIS, INDIANA

NEW DEPARTURE TILE MACHINE.

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

It makes from 18 to 22 8-inch tile, 13 inches long, per minute, and all intermediate sizes from 3 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressure in pugging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power that any other anger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be seen in operation at the clay house attached to our shop.



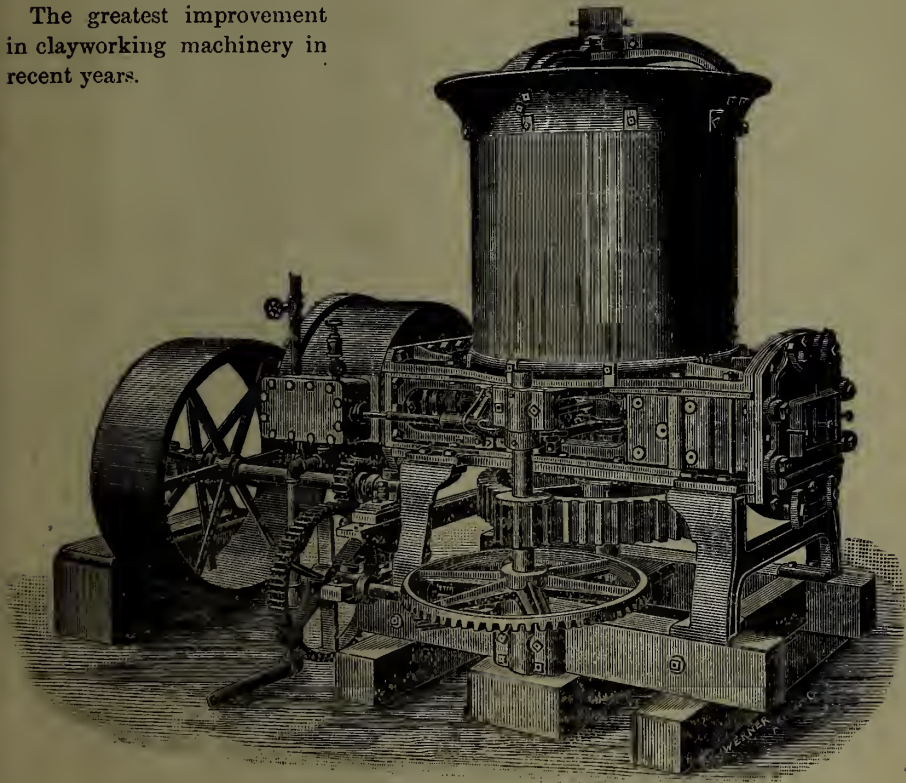
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The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



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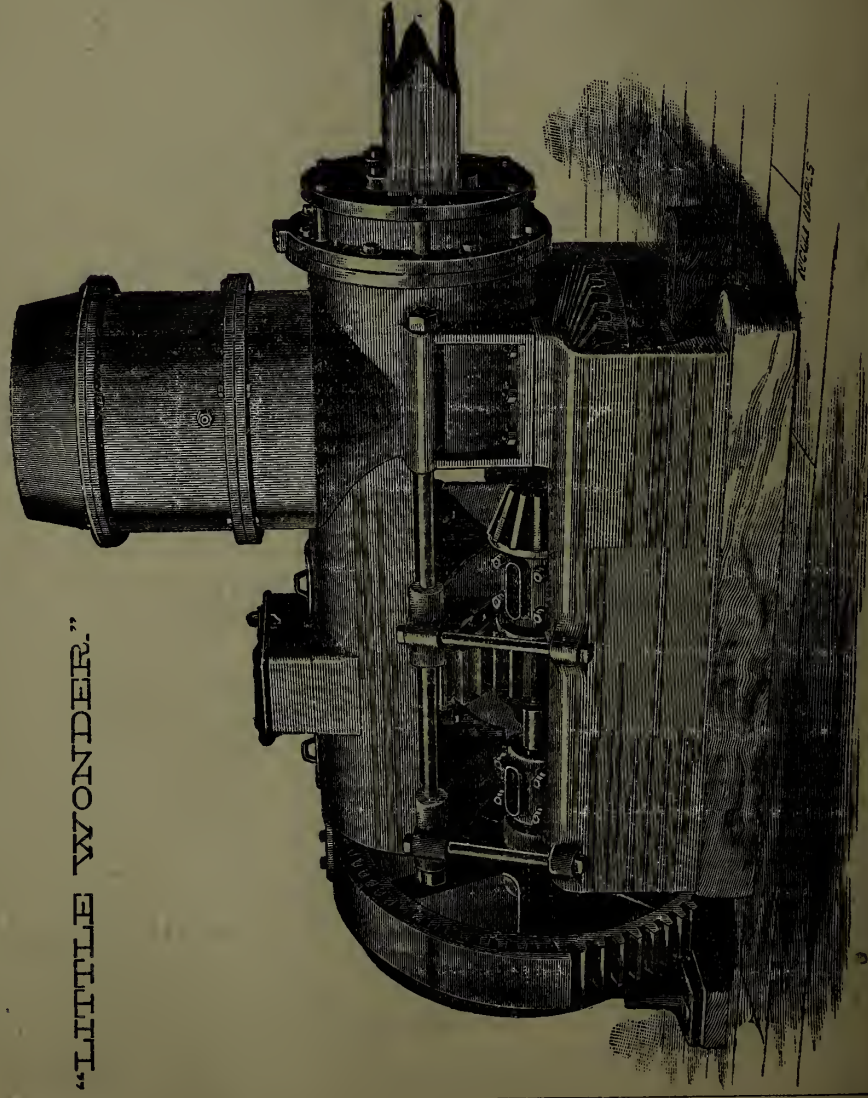
LITTLE WONDER TERRA
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ROWS FOR BRICK AND
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THE DRAINAGE JOURNAL

MAY, 1891.

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MAN'FR OF DRAIN TILE,
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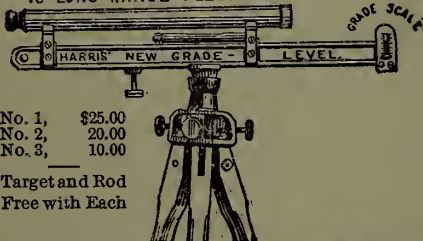
PATENTS.

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Attorney in Patent Cases.

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Kennedy's Medical Discovery cures Horrid Old Sores, Deep Seated Ulcers of **40** years' standing, Inward Tumors and every disease of the skin except Thunder Humor and Cancer that has taken root. Price \$1.50. Sold by every Druggist in the U. S. and Canada.

THE DRAINAGE JOURNAL

Vol. XIII. MAY. No. 5.

LET THE SOIL HAVE BREATH.

*BY PROF. J. W. PIKE.

The importance of breath to men and animals no tongue can describe, no pen or pencil portray. Take "away their breath, they die and return to their dust." The struggle of the 146 European prisoners in the "Black Hole of Calcutta" to get the breath of life from two little windows, (as described by Mr. Holwell, one of the 23 who lived till morning) may help us to imagine what it is to be deprived of breath. But why does our life depend, from moment to moment upon the inspiration and expiration of air to the lungs? The answer that the blood must drink the vital oxygen in the lungs from moment to moment is but a half answer. What is oxygen, what produces it and why is it necessary? Oxygen, "free oxygen," is stored energy--the energy or power of the sun embodied--and is produced from such inert products of combustion as carbonic acid and water, by the joint action of the sun and foliage of plants. The living body is kept alive from moment to moment by a ceaseless combustion of food elements and bodily tissues, a slow fire, so to speak, burning in the muscles to cause bodily motion, burning in the nerves to evolve feeling, in the brain to put in motion the fire and light of intel-

ligence and thought. The air must be supplied to keep up this combustion for the same reason that a draft of air must be supplied to the furnace of the steam engine, because the power depends on the combustion. The blood must meet the breath in the lungs to drink in the oxygen with its stored energy, and transport it through the arteries to the working organs of the body.

In this way the breath keeps the "vital sparks" burning in every living thing, on the land, in the air and in the water; mammals, reptiles, fishes, birds, insects large and small, visible (to the naked eye) and invisible; in plants as well as in animals. And the greater the activity the more rapid the breathing must be. If we put forth great effort, whether of mind or body, we must breathe more quickly to give the increase of power required. In reptiles that lie cold and torpid in the mud, the lungs may be small and the breathing slow, as in the turtle; but the tremendous energy expended by birds on the wing, as by the eagle who soars aloft in the thin air to greet the sun, requires not only lungs of power correspondingly great, but also lungs extended into air sacks in the limbs, neck and cavities in the bones, sending the breath to meet the blood, and the active tissues in all parts of the body. But in the insects, whose power is proportionately greater and whose motions are proportionately quicker--so

*The above extract is taken from the paper read before an Ohio Horticultural Society, and published in the *Ravenna Publican* of April 1st, 1891.

rapid, indeed, that, motion being the measure of time, a day must be as long to an insect as a year is to us—there are no lungs, or, more properly, the body and wings are all lungs and the breath enters the “spiracles” along the sides, passes through little tubes, called tracheae, which branch off and ramify through all the organs, and thus the vivifying air is distributed into every part, however small. Even the wings are tracheae, and their apparent rapid growth as the insect emerges from the larva skin is due to their inflation with breath.

As we extend our survey downward in the scale of life, to creatures more humble, the tracheae are more and more simple, till in the lower orders they are reduced to mere pores in the skin. And this method of imbibing air through pores in the surface would seem to be the primitive and fundamental mode of breathing. Plants inhale the air through their leaf surfaces. But in plants we have true respiration—the inhaling of oxygen and exhaling carbonic acid the same as in animals; and at the same time the contrary process, the inhaling of carbon acid and the exhaling of oxygen. In other words, plants breathe and feed upon the same air. One part in 2,000 of the air being carbonic acid, serves as plant food, but can be utilized only by the aid of light, which separates it into carbon and oxygen. But in the dark all plants take in oxygen, like animals. All the fungi do the same, whether in the dark or in the light, so do leafless parasitic plants, as the cuscuta or dodder, the orobonchae, etc. The seeds of plants, while germinating, also inhale oxygen like animals, transforming starch into carbonic acid and sugar for the nutrition of the young plant. The same process of animal respiration attend the sprouting of potatoes and the beginning of their growth. But still

more active is the respiration of oxygen by plants while flowering and setting their seeds: the starch in the disk or receptacle, being changed to sugar, part of which serves as nutrition to the pollen and ovules, and part, overflowing as honey, serves to entice the bees which fertilize the coming seeds.

But, it may be objected, the things enumerated require breath because they are living things, but the soil, being dead and cold, why should it require breath? Let us see. First: we must give the soil breath because seeds are planted in it, and without the vital oxygen seeds cannot germinate, as we have seen. Air in solution in water will not answer, at least with most seeds we cultivate; hence if the seeds are drowned in water, or planted in soil destitute of breathing pores, they are strangled, suffocated and die, and rot for want of breath. I once planted potatoes on a piece of swamp ground which I was about to underdrain. The ground was dry and mellow, the potatoes began to come up nicely, but there came a heavy rain and water stood on a part of them some three days or more. Every submerged potato was strangled by deprivation of breath and died. Prof. Carpenter (*Principles of Comparative Physiology*) has cited experimental research to show that plants “cease not by day or by night, in sunshine or in shade, to absorb oxygen from the air and to give back carbonic acid instead.” In the green portions of plants, especially the leaves, this is masked by the contrary change, but only while the light acts upon them, but in all the dark portions of the plant, including the roots, this animal respiration is continually taking place. If, therefore, the roots are deprived of breath, if the vital oxygen is excluded from them, either by excess of water, by packing, baking or in any other way,

the plant dies or dwindles, according as the exclusion is more or less complete. Of course there are some plants that can obtain their oxygen from solution of air in water, as fishes do, but the cultivated plants of our locality are suffocated and destroyed by prolonged immersion in water.

But the soil itself must have breath as well as food to keep alive the process by which it continually prepares nourishment for the vegetable world which it supports. The soil is fed by the whole vast world of living things that continually die and drop back from whence they came. In Scriptural language, "Dust they are and to dust they must return." And plants continually carry down into the soil the great stores of carbon which they have drawn from the air. The preservation of this carbon, under water, in beds of petroleum, peat and coal, also the slow combustion of that which falls on the dry land, forming carbonic acid, which turns minerals into plant food. But now we go a step further. The carbon of decaying vegetation is the respiratory food of the soil, and the soil must have breath, oxygen must combine with this carbon, for the same reason that animals and plants must have breath, that is, to support the processes of life. This is no mere analogy. The chemical change is precisely the same as in the respiration of animals. Carbonic acid is produced and energy evolved, either as heat or chemical power, the same as the slow combustion of carbon in the plant or animal. The process in the soil is even more generally and fundamental than in the animal. The oxygen attacks sulphides, protoxides and various substances and prepares them for the plant. A portion of the carbonic acid and chemical power, evolved by supplying the soil with breath, are the means of digesting minerals and liberating their plant food.

But again, the soil must have air because the air is about four-fifths nitrogen, the most expensive and important element of plant and animal food, and though both plants and animals are bathed continually in an ocean of it, neither has the power to condense it into those liquid and solid forms of energy required for the elaboration of organic tissues. This condensation is reserved for the soil to accomplish. It is done by the chemical power given off in the slow combustion of organic matter. If we feed the soil with such matter and give it plenty of breath, we need not pay out money for nitrogen. The peculiar fermentation and the agency of microbes in the process need not detain us, since, if we supply the organic matter, manure, and the breath they will take care of themselves.

But how shall we give breath to the soil? First, by removing excess of water, and second, by making the soil porous.

Nature in her wild forest home prepares a porous mulch to retain moisture and admit air in the most perfect manner. From year to year she strews the ground with layers of dead twigs and leaves. As these partly decay they are interlaced with a network of rootlets, many of which decay in turn. Myriads of seeds germinate, and the sub-soil is perforated with their tap roots in every direction, and as most of these perish from overcrowding, their decayed rootlets form a complete system of breathing tubes and pores. Thus from the top of the spongy mulch, through the soil and deep into the sub-soil, there is ample supply of air to furnish vitality, condensed nitrogen and soluble mineral to support the abundant life of the forest. The clover crop enables us to imitate forest conditions to some extent. The lower leaves drop off for mulch, the roots bore the soil and even the sub-soil

full of breathing pores, (or they become such as the roots decay) and when the clover is plowed under, the sod is like the air sacks connected with the lungs of birds, forms air cavities, masses of porous mulch which distribute the air upward and downward, and the slow combustion of the decaying clover condenses nitrogen and vitalizes the soil in the manner explained above. Similar benefits arise from plowing under the rough manure, corn fodder, straw, etc.

This is not all. The air must penetrate the soil in order that the copious dew it carries in hot, dry weather may be deposited on the cooler particles of earth below the surface, and on the thirsty roots of the growing crop. Few realize how large the quantity of watery vapor in the dryest summer. Let it pass into a cool cellar and see how the walls will drip water. On the same principle it will deposit a copious dew in the soil if it circulates freely through it. The use of the cultivator for this purpose is well understood, but *the cultivator gives the soil breath*, brings the oxygen and nitrogen into contact with carbon and the minerals and life and vigor are the result.

But of all the modes of giving the soil the breath of life there is none other so important as removing excess of water by tile drainage. Hundreds of fields on every side are in some parts suffocated, drowned by excess of water, especially in early spring. The plowing in these fields may be as well done as possible, the cultivator may be used as frequently as need be, the weeds may be kept in subjection, but the corn, or wheat or berries cannot thrive. Labor and fertilizers are to a large extent wasted on such wet ground. It is cold and backward in the spring and the belated crops, once dwarfed for want of sufficient breath, cannot recover. Let the wet

ground be underdrained and not only does the vital air produce the atmospheric and mineral fertilizers, as above explained, but the drainage water itself, which must filter through the soil to reach the tile, will deposit such fertilizers, as it may have in solution, especially such as are alkaline. It is well known to chemists that potash, ammonia, etc., do not filter through fine sand and clay. The silica having an affinity for such alkalies they are retained in the soil, but in surface drainage they float off and are lost in the rivers.

A muck swamp in one of my corn fields gave a striking illustration of this last summer. The corn was surprisingly large and well filled, which it had never been before. Two years ago lines of tiling were laid under the swamp, fifteen inches below the lower part, and winter before last water flowed in from surrounding ground and filtered through the muck instead of overflowing in a surface drain as heretofore. The layer of fine sand and clay deposited on the muck when the water was turbid, served as the top layer of the filter and was richly charged with potash and other fertilizers, hence the large field of corn. And this is one of the great benefits arising from tile drainage; it transforms the soil into a filter for retaining the soluble fertilizers which would otherwise be lost in the water which overflows from the soil.

If we underdrain our land, ploughing can be done some weeks earlier in the spring. The oxygen of the air and the carbon of the soil, being brought in contact, their union helps the sun to warm the soil, on the principle of the hot-bed, and planting can be done earlier. The cultivator can be started soon after the heaviest rainfall, whereas without the tile the cultivator must wait till the weeds gain the advantage, the ground become baked and the crops

smothered, its roots deprived of needed food and air. The amount of labor and material which is being thrown away for want of tile drainage is simply immense. The first thing to do to give the soil the breath of life is to tile the wet ground. This is the foundation upon which to build all the other processes for vitalizing the soil. The clover crop, the application of manures, the free use of the cultivator, can succeed only after the wet field is underdrained. "Seek first the tile, see that it is rightly laid, and all other needed things shall be added unto you." There are many farmers, who, not having used any tile, do not appreciate its advantages simply because they never made a beginning. Do not neglect it any longer. Try at least one wet spot, if it is only the corner of a field, to see how it works. You will want more when you see the result.

In my effort to give the whole philosophy of my subject, I have left no space for practical suggestions about laying tile, but our farm papers now have ample instructions on that matter. I will conclude with a word on my experience with tile. I laid the tile which still drains my best field just twenty-five years ago, hauling the tile from Bristolville. It has paid for itself several times over and is still as good as ever. But I made the mistake of using tile too small, only three inches for the main line and outlet. I mean to take up a part of it and replace it with six inch. And at first I supposed that at the upper end, where the line connected with the deepest water, the tile should be open to take the water. The result was several rods filled with rubbish and mud and the pond of water stood there as before. Then I took up the choked tile, and, as there was plenty of grade, I laid it deeper and continued it with branches entirely under the bottom of the swamp,

closing the upper ends with brick-bats. Now all the water is filtered to reach the tile and there is no trouble with mud or any obstruction. I use only round tile, and, in laying them, roll them round till the ends fit as closely and evenly as possible. The water can always get in if the joints are closed enough to keep out the mud. I have no trouble except with quicksand, and my remedy for that is to put down a shallow V-shaped wooden trough to support the tile and then fill in with clay or loam. The benefits of this tile drain are so plain that all who have raised wheat or corn on this field are convinced that it pays. It gives satisfactory proof that the first step in giving the soil breath, is to underdrain the wet ground.

FOOT-NOTES.

Referring to the repopularizing of the good old manettia vine, *The Rural New Yorker* declares that lots of forgotten plants are more worthy of a boom than most of the real novelties of to-day.

The Rev. Elijah P. Brown, of the *Ram's Horn*, is sometimes led to doubt the Christianity of the man who is always complaining of the dinner on washday.

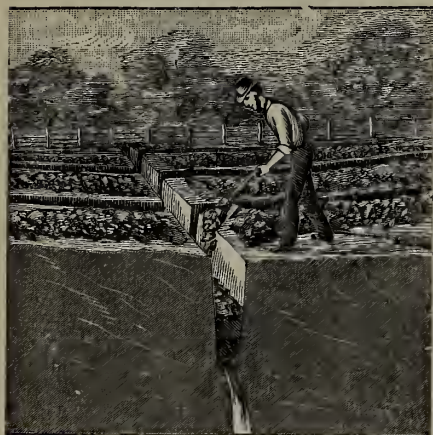
Farm, Stock and Home maintains that adequate attention has not been paid to the eyesight of assessors, those of towns and cities particularly.

The Husbandman gives timely warning against a snide agricultural paper which makes ridiculous offers to loan money to its patrons.

During two weeks recently thirty sheep were killed by dogs in the vicinity of Scotland, Conn.

Farm, Stock and Home suggests saving the paper flour sacks to put the hams and bacon in when fly-time approaches.

Farm Drainage.



SIZE OF DRAIN TILE.

The recent discussion on this subject by our correspondents has brought out valuable facts in a matter which it is important to secure a free drainage to flooded lands on one hand, and to avoid needlessly expensive size on the other. Practical farmers will learn much and judge well by continued observation in the course of their labors, but in order to reach correct estimates and accurate results, it is essential to reduce those estimates to measurement by calculation. They must first learn by reducing their intended work to figures how much water there may be in the soil to get rid of, and next how long a pipe-tile of a given calibre will be in carrying off this needless water from a given area.

Suppose, for example, that the largest quantity of water in a soil saturated to a depth as great as cultivation and drainage extend, is equal to depth of 3 inches over the whole surface, which would be over a thousand hogsheads an acre. The drains should be sufficient to carry this needless water in about 24 hours.

The common distance of drains from each other where thorough work is intended, is about two rods, each one drawing off the water a rod on each side. An acre in a strip of land two rods wide must be 80 rods long, and to drain this acre the tile must be large enough to carry off the thousand hogsheads in 24 hours. This estimate will, of course, vary with the descent of the land; a 2-inch pipe-tile will do it, with a descent of 1 foot in 20, provided the tube is perfectly smooth and straight; but with ordinary roughness of surface the descent should be about 1 foot in 12. A 3-inch tile would be required with a descent of 1 foot in 40 or 50; and also when it must require several branches. The aggregate length of the branches will be reckoned the same as of a single drain of equal length.

In making estimate of the required size of the tile, it is necessary to take the rate of descent into the calculation with some accuracy. A common mechanic's level will answer this purpose, using a graduated pole to measure the height, and a tape-line for measuring distances. The following table gives the size of the bore of different slopes (and which the writer for this article calculated and published thirty years ago,) will aid in the estimates:

<i>A bore of</i>	<i>With 1 foot</i>	<i>Will discharge in hogsheads in 24 hours</i>
2 inches.....	in 100	400
do.	in 20	900
do.	in 10	1290
3 inches.....	in 100	1170
do.	in 20	3100
do.	in 10	3600

Intermediate rates of descent may be estimated with sufficient accuracy in common practice. The rough and uneven surface of the tile will reduce the amount of water discharged from one-third to one-half—more in the smaller than in the larger pipe. In very short drains the quantity would be somewhat

less, as some length is required to give the water sufficient velocity.

When small quantities of water are carried off, pipe-tile will act more efficiently than horse-shoe tile, because its interior from the water is brought together in a narrow and free channel, while in a horse-shoe tile it is spread thinly over a surface, giving it a more feeble current, and making it more liable to be checked by sediment.

The distance apart, and the size of the tile, will be controlled more or less by the character of the soil. If distinctly stratified or originally deposited in layers, the water will flow in a horizontal direction more freely than when no stratified soil exists. A compact clay soil will be more slowly drained than a porous one, and a smaller pipe may be used; or the drain may be of greater length. It will be observed that after the soil has been suddenly flooded by a heavy rain, that portion nearest the ditch will first discharge its surplus into the drain, and this becoming dry will then receive the water from the soil more remote; and consequently in wet seasons the crop will be most benefited near the drains, and less so in the space between them. There may, therefore, be occasions where soils will not part with their surplus freely, where more numerous drains may become necessary. Of this the owner must judge by personal observation.—*Cauntry Gentleman*

DATA OF DRAINAGE.

Although machinery has not proved very successful in ditching, methods have changed materially for the better in the last few years. Now on all but bogs the plough is used to turn over the sod and loosen the sub-soil, so it can be shovelled out. Under favorable circumstances fifteen inches can be removed for about half the sum it formerly cost

to hire a professional ditcher. Filling in is also done with a plough, and with a steady team and a long double tree 100 rods of 3-foot ditch can be nicely filled in a day. The fashion that formerly prevailed of putting in 1 or 2 feet of stone on top of the tile is much less prevalent, and rightly so, as it brings unequal pressure on the tile and is likely to deflect some of them from a true line. I have known the filling to be delayed for two weeks, and the planting of crops likewise delayed, while a farmer was drawing stones and straw to put in the ditches. The idea that the ditch will take water faster if half full of stones is of little practical value, as it only amounts to the difference between the spaces among the stones and the equal bulk of porous earth. As to the depth of ditches, it is generally conceded that 36 inches is about right. Although another foot is better, it costs in clay soils nearly as much to dig the additional foot as the first three, which is out of all proportion to the additional benefit. It is generally thought that an inch to the rod is as little fall as should be tolerated, but there are cases where less than half that has proved of great use. A few miles from my home is a tract of twenty-five acres, where the mains at the upper end are but 2 feet deep, and the laterals 1 foot below the surface at the upper end, and the fall at the rate of 5 inches to 12 rods, yet the drainage is satisfactory, and what was once a tamarack swamp is arable land, and has produced in a not very favorable season twenty-seven bushels of wheat to the acre. Five profitable crops of grain and grass were taken in succession from this ground. There is often a mistaken economy in using an apparently cheap outlet, such as a highway ditch, or railway. On one farm the outlets to several tile ditches are made to empty in a highway ditch, which is also tiled, as

a greater security to those emptying into it. The highway ditches passed another field, which, although not so wet as the one tiled, yet often fails of a full crop in a very wet season. Had the main or outlet ditch been put two rods in the field it would have carried it partly through the adjoining field, and drained one side of that as well.

At a recent gathering it came out that several farmers had been putting their largest tile at the upper end of the ditch. One used 24-inch pipe half way, and then 18-inch the rest of the way. Another laid the upper third of his 3-inch drains with four inch tile. They reasoned that because a pipe didn't discharge full at the end it could carry more water, but failed to show how, when a pipe was large enough to drain the land, any more could be got by using a larger one. The money used in both these cases would have bought a Comstock's or Olmstead's school philosophy, and paid for many hours' study. All drains should be plugged at their upper ends. Plugs made of cement are best—made by setting the ends of a tile on to a pat of cement. Tile should join nicely, and any cracks too large to squeeze the finger into be covered with a bit of larger tile. No one but a careful man should lay the tile, and care should be taken not to have parts of the ditch too deep. A green hand is apt to dig too deep in soft soil and too shallow in hard, or exactly contrary to what he should. In conclusion, where the fall is slight, or the job in any way intricate, an engineer or man of experience should be employed. The engineering faculty is not largely developed in many persons, and professional ditchers are often very ignorant of everything but the use of a spade.— *N.Y. Tribune*.

Organize a farmers' club in your neighborhood and attend it regularly—it will pay.

THE PROGRESS OF TILE DRAINAGE IN LOUISIANA.

BY F. L. DELFER.

After having in previous numbers described the present mode of open ditching, as practiced on the sugar plantations, and the great advantage which tile would have over that system, I wish to say a few words about the prospects here for the benefit of those who might want to come. When I first came down here in the fall of '88, and laid around without anything to do for several months, Mr. Ridgway, of Ridgway & Outland tried to cheer me up by saying, that this was a land of great possibilities, and I answered him that I was not looking for that kind of a country, but for a land of great realities. I fear that this will continue to be the land of possibilities yet for some time to come.

Last summer I was the only one left in this country who even pretended to lay any tile, and I did not work steady at it myself, part of my time being taken up with building about three miles of narrow gauge plantation railroad, etc. I don't think there was as much tiling done the past winter, as the winter before. There are many reasons why the planters do not go into the business, but there is no need of speculating about any of them in special; only I will state that the uncertainty of the sugar business, bounty or no bounty, tariff or no tariff, is another serious obstacle to the introduction of tile. Sugar cannot be made here without protection of some sort.

I will give a brief sketch of the life on a plantation for the information of intending newcomers. All the field work is done by negroes and Italians. Their pay is seventy-cents a day without board, but cabin and fire wood (standing) free. White men do not want to work with

the negroes, nor would they be hired if they did want to do so. As a manager told me once, "the best labor we can have here is 'niggers,' and the thicker the lips the better the 'nigger'." The blacksmiths and wheelrights are either white or black, and if the latter, they rarely get more than a dollar a day, and the former about forty or forty-five dollars a month. The latter (\$45) was the pay of a blacksmith I knew, who was said to be one of the best in Louisiana. In the city of course the pay is higher. In the grinding season (sugar-making) wages are better, and many white men work about the sugar houses then, but as soon as that is over there is no work for a white man on a plantation. The Creole people do not like the coming even of Southern white people amongst them, and when we remember that nearly all the Southern people were ruined by the war, we cannot be surprised in finding a little strained feeling by many Southern people towards Northerners. This generally wears off though on better acquaintance. While there are many excellent, good and sensible people here, a tile man's business does not allow him to stay always with them.

It may be said there are at least four distinct classes on a sugar plantation. To commence with the most numerous, (1) the negroes, (2) the Italians, (3) the white sugar house hands and mechanics, (4) the manager and overseer. The Creoles, when poor, called "Cajans," form another distinct class of small landholders, and, practically, not to say absolutely, no social intercourse exists between any of these five classes. The negroes and dagoes dislike each other cordially.

P. S.—After writing the above, I see Mr. J. Arnett's paper in the April number, and find that he is mistaken in the

man, as to the authorship of what he considers a mistake in tile drainage matters. In the August number referred to, I had only quoted the opinion of a German professor and author of a drainage book, who stated that tile were more effective when the outlet tile was submerged in water. I did not say that I agreed with the professor, but I merely quoted him to show that the temporary immersion of the outlet tile by freshets would not be so very injurious. I fail to see how anybody could understand me different.

In conclusion, I will say, that my experience and ideas about outlets, fall in ditches, etc., is precisely similar to that of anybody else, possessed of a medium portion of common sense, who has followed the business of laying tile since 1870, uninterruptedly as I have myself.

Agricultural.

TILING WHEAT LAND.

During the month just past wheat growers have been on the anxious seat. The wheat crop up to March looked well. But past experience teaches that the month of March is the critical period. Last year, the crop was badly damaged in March as has been the case more or less in the past. The following extract from a correspondent of the *National Stockman* is to the point:

"One class of farmers are less anxious than others, namely, those who have their lands well tiled. They pass over their wheat fields and find the crowns of the plants resting on the soil, with the roots all firm in the soil. Mulching with straw is recommended, but tile drainage is far superior to this. Manuring is advocated to give the soil more life. This fails in the wettest soils, seeming to render the land more sodden. It

makes no difference whether the soil is clay or black loam, poor or rich, if saturated with water a freeze will lift the roots of the plants growing in it. If an enumeration were taken of farmers who sow wheat on wet lands, and only hope for a crop with a favorable season, they would be found to be legion, and they have been sowing this way for years, once in a decade, probably, securing a paying crop. Most of this unprofitable work is done on lands that could be made to bring profitable crops almost every year. Tile drainage should be the first step. With this beginning, the future value of the land is under the control of the farmer. With this foundation perfectly laid he can build almost as he desires."

Still there are legions of farmers who drag along, year in and year out, blaming the good Lord without reason, when, if they would underdrain their lands thoroughly, they might have a good wheat crop every season.

COMMON ERRORS.

A veteran farmer says that in his experience of forty years he can recall the following errors in the conduct of his farm. It was error in him:

1. To think all farmers, were strictly honest.
2. To sow my oats too thick—thereby getting very fine straw with little else.
3. To buy superannuated horses.
4. To depend on others to cut my harvest.
5. Buying old machinery and wagons.
6. Going to law with men destitute of property and character.
7. Planting imperfect seed.
8. Working beyond my strength.
9. Letting notes become overdue.
10. Too curt a manner with workmen.
11. Failing to hold special customers.
12. Marketing produce at wrong time or place.

13. Buying too dear and selling too cheap.

14. Want of definiteness in making contracts and neglect to reduce same to writing.

15. Not keeping a regular account of income and expenses.

CLOVER AS A FERTILIZER AND ITS USE IN CROP ROTATION.

*BY J. J. W. BILLINGSLEY.

It is not my purpose to deliver a sermon, but I will take a text as an introductory to the remarks I wish to make. In an oft-neglected book of mine I remember having read about the unjust steward, who was commanded by his Lord to render an account of his stewardship that he might be steward no longer. The unjust steward went to one of his Lord's debtors and asked, how much owest thou my Lord; and he said, one hundred talents. The unjust steward said, write fifty. To another who owed forty, he said, write twenty; and so on, so that he made for himself friends that, when his stewardship failed, they would take him into everlasting habitations. And it was added that the children of this world are wiser than the children of light.

It is not my purpose to give you an exposition of this Scripture, for, to confess the truth, it has always staggered me a little—that is if our Lord is understood to commend the unjust steward. However, I will leave that for those who have given the text a more careful study.

But, changing the phraseology, I will say to him that has been cultivating fifty acres of corn, write quickly twenty-five acres, or forty acres in wheat, write twenty, and so on. If you ask me what you shall do with the other twenty-five or

*Read before the Madison County (Ind.) Farmers' Institute, February 18, 1891.

twenty acres, my reply is, "let them go to grass." What kind of grass? My reply is, "Clover." Clover is not grass; but it serves for grass.

Now put on your glasses of observation and gird up your loins and answer me. Does more than half of the land in cultivation pay dollar for dollar for the labor and money expended in the cultivation of the crops grown? What do you say? If not more than half now in cultivation is remunerative, what of the other half? The word is sounded up and down the land that farming does not pay—that is some farming does not pay. Some farming does pay.

Those that are putting in a dollar's worth of labor good and honest, and are getting back only seventy-five cents of the dollar or less, how long can they stand it? Now, I want to act the part of the good Samaritan. I want to carry them to an inn and show them how they can pay the bill, and leave no balance to be paid on my return. Again I hear it said that the cultivated lands of this State are deteriorating in fertility equal to 5 per cent. per annum. I do not know how true this statement may be, but I do know that more than half of the land now in cultivation does not yield such a crop return by a large per cent. that it did twenty years ago. I do know that the constant cropping, the washing of the land and the imperfect methods of cultivating are telling on the fertility. The old adage of "always taking out of the meal tub and putting nothing in, brings us to the bottom by and by," is not only true of meal, but likewise true of the soil.

Now for the remedy, or "Let the half go to grass." How will it work. I will tell you how it has worked for me. In 1864 I found myself in possession of a farm but recently purchased that had been in cultivation for fifty years. The

soil was a close retentive clay in part and a part clay loam well mixed with sand. My first crop of wheat, which embraced almost one hundred acres, with the intention of letting more than half go to grass, gave me a yield of less than eleven bushels. The season was not favorable, but I could hardly expect more than fifteen bushels per acre of a favorable season. Some sixty acres were sown to clover, and the clover land pastured lightly and fed on in the winter, buying the feed for about one hundred head of cattle from my neighbors. A portion of the clover land, after the second year's crop, which was again lightly pastured and the second crop or seed crop was allowed to come into full bloom, was then turned under and the surface of the plowed land made very fine by repeated harrowing, and was then sowed in wheat. The following harvest we had a yield of twenty-six bushels of wheat to the acre, and the land went to clover again.

Another portion of the clover was planted to corn on clover sod the spring following, which we gave a level culture and had a yield of seventy bushels per acre.

The cattle were bought and fed upon the clover sod for the especial purpose of bettering the fertility—the droppings and liquid fertilizers were all saved to the land. It is well, perhaps, to say in this connection that I put in a number of underdrains, and they served a double purpose of making the soil open and easily cultivated and also admitting the liquid manure down into the soil. But, to be brief, by alternating my crops of corn and wheat with clover until the increased yield was marvelous to some of my good neighbors. One field I will mention in particular. My neighbors called it the poor field. Two crops of clover were pastured lightly, and the

second crop of the second year, together with the first crop that had been straggled down by the cattle, was turned under and sowed to wheat. The yield of wheat the following year was twenty-six bushels per acre. The field was then clovered again, and the first crop of the next year mowed for hay and the second crop turned under for wheat and sowed early in September, and the following year we had a yield of twenty-eight bushels of wheat, machine measure, or probably thirty bushels by weight.

The results from clovering my own land has been so satisfactory in the past that I put a very high estimate upon the value of clover as a crop. I can not tell how it increases the fertility. There are so many secrets locked up in the earth upon which we move and have our being that I feel that I have not learned my A. B. C.'s as to its wonders. I do know that it is the great laboratory in which the food for plants is being prepared day and night, winter and summer. I do know that clover roots go down deep into the earth for food, down to some of our lower farms.

Emerson once said, when speaking of the benefits of farm drainage and the increased depth added to the fertility of the soil by underdraining, "There are," said he, "farms underneath our farms that we know not of until we under-drain." And may we not truthfully say that by the deep rooting of clover we draw upon our lower farms. We have seen clover roots that had penetrated the earth to the depth of three and one-half to four feet deep in close subsoil, and I believe that they very commonly go down to that depth if the water level does not seriously interfere with them. The roots make openings in the soil and grow to full size the first year. The roots afterwards decay and leave openings down into the depths beneath,

partly filled with the decayed vegetable matter, inviting the roots of other crops grown on the land to follow down in these openings for stores of plant food.

But further I believe that the roots in some way possess the power of pumping up the fertility of the lower farm, leaving the store near the surface on the upper farm. Some way or other the plant possesses marvelous power. Some of the fertility may be taken up by the plant from the air, but this question has not been determined to a certainty. Some of our agricultural chemists maintain that the plant does derive much of its nourishment from the air, whilst others say that they do not know it to be the fact. Some experiments have been made at Cornell University to determine the value of the clover plant, which may be of interest. The tops of a crop of clover, when well dried, weighed 3,295 pounds per acre. The roots from one rod were dug, washed and dried. The rod being taken as a unit for calculation, it was found that the roots of one acre weighed 4,883 pounds. Or the entire weight of both top and plant aggregated 8,188 pounds. The crop per acre was found by analysis to be as follows:

Nitrogen 76 lb. at 15 cts., worth....	\$11.41.
Potash 90.28 lb. at 4 cts., worth.....	3.61.
Phosphoric acid 17.46 lb. worth...	1.00.

\$15.02.

The weight of the roots is worthy of note, weighing as they did so much more than the tops.

Another analysis shows the value of the crop tops and roots of a heavy second crop to be worth for fertilizing purposes \$18.83—that is taking the market value of commercial fertilizers as the standard of value. To the \$18.83 add the value of the first crop for hay at \$14, and we have a total value for the year's cropping for hay and for the soil,

\$32.83. After cutting the second crop the land may be sown to wheat with as much or more promise of a remunerative yield than can be reasonably expected from following any other farm crop.

But again, suppose we cut the first crop for hay and estimate the value of the hay for market at \$14; and cut the second crop for seed, that the average yield of seed is three bushels, we have a seed value of \$12 or \$15, which, added to the hay crop, aggregates \$28. Say \$25. Can you name a crop that will give better returns and at the same time improve the soil? In cutting for seed, if the work is done with header, the tops remaining will serve to fertilize the ground. Clover for hay, if well cured, is better than timothy for cattle or sheep, and we might say hogs and chickens. The hogs and chickens will not eat the coarse stems, but they will eat the leaves and small branches. Mr. T. B. Terry and other good farmers that I know make clover hay the principal feed for their work horses without using grain.

But, referring again briefly to clover as a rotation with other crops, let me say that, if the land is poor, I would make the rotation wheat and clover, year about for about four years. However, if my farm was situated so as to make some large city market available, I would use potatoes and clover on a part of the land at least. Otherwise, if the soil was fairly productive, then I would probably use clover, wheat and corn for rotation. We do not claim that clover is king, but it is at least the power behind the throne for successful farming in cropping our land. Now we conclude that, if half our land was sowed to clover and then rotated with other crops, the twenty-five acres of corn, after having brought up the fertility with clover, would give us a better profit

than the 50, or the 20 acres of wheat more profit than the 40 without clover.

Again we say for fifty write twenty-five, for forty write twenty. So that it may be truthfully said that the farmers of this State are wise in their day and generation. Do not forget to underdrain and cultivate carefully. The trinity of success in farming a naturally good clay soil is underdraining, clove and intelligent cultivation. And these are one in the ultimate success.

"THERE IS A WAY OUT, AND UP."

We always like the sound hard sense of T. B. Terry. He believes in being *intelligently* practical, and like all brainy men has no sympathy with those men who think that the farmer who don't read, or study, and never attend a convention or institute is the only practical man. In writing to the *Ohio Farmer* the other day, Mr. Terry gave the following statement:

"Now I am not saying this to advise any one to do just *this* way; but rather to *think* and *study* what is best for him. There is a way out and up for any one. I remember one young farmer telling at an institute how he couldn't make any money in the old way, out of sheep, when wool went down, and so he gave more attention to pushing lambs for market and had thus made money right through, keeping sheep. Reading, thinking and study did it. He changed with the times. Dairying pursued in the old way no longer pays; but we have plenty of thinking men who are making money right along in that line. The hill farmers in the southern part of Ohio feel that there is not much money in stock any more, and it ruins their hillsides to farm them, they wash so badly. Many of them seem utterly discouraged with the outlook. But right in their midst are men who have fitted

their plans to the location and times are prospering. For example, I saw one farm where not an acre has been plowed for fifteen years. They keep Jersey or grade Jersey stock, and the land in permanent grass; they make butter and feed the milk to calves and pigs. All grain is bought. I am almost afraid to tell you that this man is carrying an animal, large or small to about each acre and a half, and is said by his neighbors to be living well and laying up money right along on his little farm. He has done some thinking for himself, and is farming the way his farm will bring him the best returns."

The very fact that right in the midst of a neighborhood of unsuccessful farmers may be found representative successful farmers, is proof positive that the fault for a lack of success lies with the men, not the times. The feature is found every where, and particularly in dairy communities. Right among the patrons of a single cheese factory or creamery can be found those who make double the profit per cow that others do. Envy and a silly local jealousy seem to blind the eye's of many men so they are utterly unable to learn anything from a more successful neighbor. About a year ago we were talking to a group of creamery patrons about the difference in the yield of butter from their herds as measured by the cow. One man in the creamery had furnished nearly double the butter per cow, that the rest had, and, as a matter of course, had drawn about double the money from the concern. When we tried to show them that they were alone to be blamed for their poor results, that if they had put in the same amount of brains and energy into the pool, that the successful man did, they would get the same results, there was not a man among them who was willing to admit the truth of our

statement. It hurt their vanity to make the acknowledgement; and so they had rather continue in the same old rut, grumbling along with poor cows, and bad management, and pet their sickly pride, even if they did not make a cent. Men of sense and reason, never pay too high a price for vanity.—*Hoards Dairy-man.*

FACTS TO BE REMEMBERED

Only a few spare hours are needed to turn a repulsive building into an attractive and desirable one, if taste is used in choosing the paint and applying it.

A gate hanging by one hinge is a sermon to every one who passes by your farm. Everyone can read its meaning and the comments are various and entertaining.

Good roads from the nearest city or village to your farm are worth more than any other one circumstance in insuring prosperity.

The great object before you is a happy and contented life. Never be willing to have anything interfere with the accomplishment of this object.

The live stock on the farm comprises cattle, horses, sheep, swine, poultry and bees. Do not fail to consider the poultry and bees a part of the farm stock.

You cannot make everything yourself; but you can make very useful things if you will use the otherwise idle moments to this purpose.

The growing and turning under of clover is the best means of permanently restoring and enriching land.

The estimate of our annual production of poultry and eggs ranges from two to five hundred millions of dollars. It is immense even at the lowest estimate, and yet we import millions of dollars

worth of eggs. We do not supply the demand.

A little slicking up of your place and surroundings with good roads will add hundreds of dollars to the value of your farm. The appearance and the approach to your home are of great value.

Preparing the land for the crop is more than half the battle. After that, the character of the seed, and how it is sown, and how it is tended help in the final result.—*Maryland Farmer.*

IMPROVING WET SOIL.

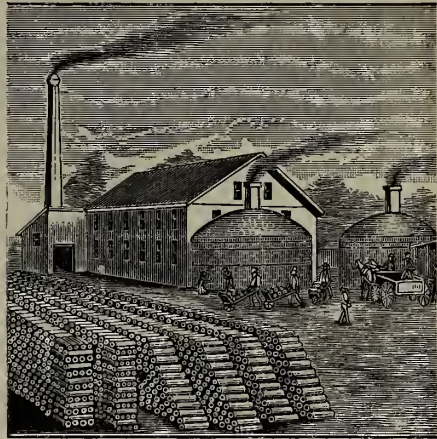
The only way to permanently improve land too wet for growing the ordinary crops is to drain it. Sometimes this may be done so as to be very helpful by surface ditches that will carry off most of the surplus water. In general, however, wet lands can only be brought into good condition for all crops by under-draining in addition to surface drains. Whether it will pay to reclaim a piece of land of this description by these methods will depend entirely on the average land in the vicinity and the ease or difficulty with which the drainage can be effected. Quite often lands of this character when well drained are exceedingly productive.—*Ex.*

Mr. T. D. Curtis, reporting certain aggravated depredations upon the sheep interest, exclaims: "Truly, the prosperity of the country may be said to have gone to the dogs!"

Mr. S. M. Owen gives the timely reminder that "the better the garden the smaller the grocery bills."

North of England farmers complain of high wages for ploughmen—a condition supposed to be due in part to competition for labor in the manufacturing centres.

Tilemaking.



GLEANINGS FROM TEN YEARS EXPERIENCE MAKING DRAIN TILE.

*BY M. HORLOCKER.

Now, if you will come with me to my plant any day, I will give you an object lesson with my own hands, but to tell the same on paper is quite another thing.

The tendency of humanity is to look forward, not backward. From the cradle to the grave we look onward, ever onward. Hope buoys us up and on. As we are sailing on the sea of life we should at times cast anchor and take our observation to see whether we are drifting with the tide or making toward the desired harbor. We should profit by the experiences of the past. We should be able to see where we made mistakes, how they were made, and how we might have avoided or remedied them. There is at least one thing which every drain tile maker should keep uppermost in his mind or make paramount in his mode of making tile, and that is quality. After that comes

*Read before the Ohio Brick Tile and Drainage Convention, February, 1891.

cast, then use, followed by quantity. It is presumed that we have set our standard of manufactured articles high, and have been steadily working up to it. If we have not, then it is high time we were doing so.

Fellow craftsmen, let us not be content to manufacture an article that will do or that is equal to that made by others, but let us strive to excel not in quantity, but in quality. In fact make a product of such a quality that the trade can not afford to purchase elsewhere. Now, how can this be done? If I may use a quotation I will answer, by eternal vigilance. Yes, vigilance from one end of the process of manufacturing to the other. We all, of course, have good machines, plenty of power, good buildings, etc., etc. (And perhaps patent kilns.) I know that they (the machines) are good, for no manufacturer of clay-working machinery would make any but good, at least so they say. But, as to kilns, I would suggest that we go slow about investing in them, as we might be too fast, and some one would soon have a patent kiln with which we could make perfect burns with, perhaps, no other fuel than air, or air in motion. And then we would have to try again.

But to return. I said machinery, power, buildings, etc. The next thing is clay, and of course that we all have, and in endless variety, quality and kind. Some may have this property; some that property; some may work hard; some may fuse easily; some crack in drying, etc., etc.; but there is a remedy. Investigate; look after the tempering; try the admixture of some other clay, a little fine sand or a little something else until it works drier and burns satisfactory. What if we do not have it near at hand? What if we have to ship some other clay to mix with ours? The

extra cost we would soon make up in the ease of making and beauty of the product. Now the same remedies. Close attention; the exercise of a little common sense; a little thought; a little experimenting, will remedy nearly or quite all the difficulties we have to contend with in the clay in both making, drying and burning. (Personally the writer is adverse to the use of any substance or matter, such as sawdust, coal slack, etc., that will in firing burn out and leave the ware porous, as it lessens the strength and destroys the clear metallic ring of the tile.) Now, if we have the clay in good shape, we are ready to make tile, which should be made no faster than they can be handled and placed on the drying floors, shelves or pallets (whatever system you use) carefully. Give the men plenty of time to handle them carefully, so as not to mar them any more than possible. And then hold every one responsible for the look and shape. If an employe neglects to do so, we should have no longer use for him. To the writer it seems as nonsense to rush things and then have a large percentage of the output of the machine worthless, or nearly so. He would say, "Make haste slowly." In fact handle them (the tile) carefully at every stage of the process of manufacture.

Next comes the firing or burning, and the most important part, perhaps, and of which the writer will have the least to say. Suffice it say, any system of burning that does not make every tile hard enough to resist the action of frost, does not approach very nearly to uniformity, saving with fuel, and also leave the tile with a clear metallic ring, as well as reduce the loss to less than one half of 1 per cent., we should not be content with, for it can be done and done every time, and with nothing more

than a common round, down draft kiln.

Again go slow. We should not be afraid of an extra cord of wood, or a ton of coal, or an extra half day or day. The idea uppermost in our minds should be a good burn. After the tile are properly burned place them on the yard in good shape, in nice straight piles, so as to look attractively and show to advantage. As to quality, enough.

Now cost. There are many ways that the cost can be reduced, which we may readily see by close observation, and there are many corners that may be cut off, so as to approach more nearly the circle and lessen the jar^o and friction upon our pocketbook, and make things run more smoothly. We should remember that the less the cost the more the profit. A very great incentive, for when you strike a man's pocketbook you hit him hard.

Again. Use of tile. I, perhaps, ought to have said use and misuse of tile, for it is a fact, we are suffering to-day very much from the misuse of tile. There has been much work done which, for want of knowledge or from carelessness, is almost worthless, and undoubtedly has much to do in deterring others from using tile. It behooves us all to use all of our influence, both by example and precept, to have the work of under-draining done well, for our own interest, if for no other, to increase the demand for tile and to increase the dollars in our pockets. No man can plead ignorance, now, in the light of all that has been said and written on under-drainage or farm drainage. Yet we must keep the ball rolling; keep the subject agitated. No great, or, for that matter, no, reforms have been accomplished without agitation. If we can succeed (and we can) in having what drainage work there is done well done, then we will have left an imprint or an

improvement that coming generations may inherit, or (if it is not out of place to quote from Longfellow) will have left

Footprints on the sands of time,
Footprints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing, shall take heart again.

It is true that with us as a people (we Americans); there is a tendency to do everything on a high-pressure system, for to-day, the present generation, and not for posterity, when, if it were well done, it would be for the present as well as for the future, yea, for almost untold ages to come.

At last, quantity. On this there is little for me to say. If we have mastered the three other requisites, when the demand for our ware suggests it, we can readily find a way to increase the quantity to any desired amount.

Drainage & Tile News.

THE NEW tile factory at Buckley, Ill., is about ready to open up business.

THE DRAINAGE SYSTEM planned for the lands about Tuscola, Ill. will require a ditch nine miles long.

THE PELLA (Iowa), Tile Factory has put in a new engine and boiler and will do a big business this year.

THE COLCHESTER (Ill.) Tile Works have commenced operations with a fine business prospect for this season.

THE COLFAX, Ill. Tile Factory has started up for the season with a good prospect for business this season.

DRAINAGE FOR BETTER HEALTH.—The citizens of Savannah, Ga. and vicinity are organizing to secure the drainage of the low land near that city to improve the general health.

A NEW DRAINAGE DISTRICT was recently formed in the townships of Hamilton, Lee and Hahnaman, Whiteside County, Ill. and \$5,000 was levied for a new ditch.

THE ALBANY (Ore.) TILE FACTORY, F. Propst, Proprietor, is doing a good business on the Pacific Coast. The benefits of tile drainage are being realized by the farmers in that section and the interest in drainage is increasing.

ANOTHER BIG DRAINAGE CANAL.—The fourth big canal for drainage purposes in that section is now being projected and the letting of the contract will take place at Tuscola, Ill., May 1st. The canal will be 9 miles long, 30 feet wide and 8 feet deep.

ANOTHER DRAINAGE DISTRICT. Notice has been given of the organization of a drainage district in the County of Iroquois, Ill. to be called North Sheldon and South Concord Drainage District No. 1, embracing over 10 sections of land.

JOINT COUNTY DITCH.—The Commissioners of Knox and Licking Counties, Ohio, met April 23d to consider the construction of a joint county ditch. Commissioner Vannatta of Knox County was chosen Chairman, and Commissioner Jones, of Licking County, Secretary.

TILE WANTED. A party residing near Charleston, South Carolina, wishes to purchase a carload of 12-inch drain tile. Will those of our readers who are making these sizes at points convenient to ship them send their address to this office stating the price delivered on board the cars?

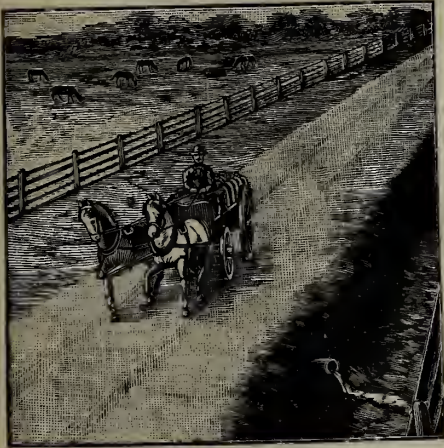
A DRAINAGE SCHEME for suburban lands near this City (Indianapolis), is under consideration, which will require an immense open ditch to turn the watershed of a large area of land into Fall Creek above the city, and thus effect the better drainage of a large section of land northeast of the city.

THE LA MARSH drainage district has placed the steam boiler in the new pumping building on the west side of the river. They are expecting the new engine from Indianapolis every day, when it will be put in position and their large ten-inch pump set to work sucking the water out of that drainage district.

A CHANGE OF LOCATION. We copy the following item from the *Chicago Times*: "J. G. Shea, of Decatur, Ill., may be truthfully said to be the father of the paving brick business in that city. * * It is partly through his influence that the Brown-Frazier Mfg. Co. of Portland, Ind., have decided to remove to Decatur in the next sixty days. They have purchased five acres of ground from the Decatur Tile Co. on which they will immediately erect a large plant for the manufacture of the famous Leader Brick and Tile Machine and a full line of clay working machinery. They will incorporate under the State laws with a paid up capital of \$35,000 and be known in the future as the Leader Manufacturing Co. The members of the Decatur Tile Co. and other prominent capitalists of Decatur are stockholders.

W. N. NICHOLS, of Nicholsville, Ala., writes: "I am very anxious for some one to put up a tile factory in my neighborhood. I have some low lands that need underdraining very much. I would be willing to take an interest in a factory with the right man—one that can make the tile and put them in the ditch. What will a small outfit cost to make tile and brick combined? I have the power to run it if the clays near my mill will do. I can furnish all the lumber that will be needed." Here is an opportunity for some party who has a little capital and is desirous of going to a milder climate, and who has the requisite experience, to locate and go into business. Mr. Nichols evidently does not anticipate a large business. But a small factory conveniently arranged and run economically might prove to be profitable and pleasant. As to the least cost, those having the experience and being inclined to investigate this opening for business, can figure up the cost and write Mr. Nichols.—Ed.

Road Drainage.



GOOD ROADS.

When we reflect upon it, it seems a matter of surprise that our people can remain satisfied with the general condition of the public roads throughout the country. Yet it appears that we are all something like the old fellow in Arkansas, who, when asked why he did not finish covering his house, replied: "Wall, stranger, when it don't rain it aint any use, and when it do rain I kaint." Just so it is with us in regard to working roads. In the summer when it is dry, the roads are necessarily good and travel is easy; but in the winter when the rainy season sets in and the roads become muddy and boggy, we cannot work them.

Until we have a radical change in our present bungling system of working roads, it cannot be expected that our highways will ever be improved, or be in a condition to use during rainy season.

Once or twice a year the road overseers call those who are subject to "road duty" together. Some will have hoes, a few spades, others axes, one or two will

bring a team and plow—for which extra compensation is allowed—and some bring no implements at all. With this badly equipped force the "generalissimo of highways" begins the ludicrous farce of improving the roads. Moving along without any method or well defined idea of what should be done, and how it should be done, the work (?) begins. Here and there the plowman runs a few shallow furrows; the hoemen pull out the dirt to the center, and the spademen throw a few shovels from the sides, and *par excellence* this scratching and scraping is called grading or roadmaking. No ditches of any depth are made on the sides to drain the road-bed, and very often the center is the lowest part of the road. Merrily the laborers go on, laughing and cracking jokes, going through a routine called work, and the demands of the "Road Law" are said to be complied with. No one will deny that this is the usual method of road-working in Louisiana says the Crowley, La., *Signal*. Yet, with such tools to work with, and with such laxity in enforcing the road laws how can we except anything better?

The only relief that we can see is in an entire change of the laws regulating the working of roads. Instead of the present inefficient system of requiring so many days, labor—that is so badly performed—let a special tax be levied for road purposes. With this fund let each parish purchase one or two good road machines; a ditching machine, a road-plow, and some scrapers. Then let out the contract to some capable man for the year to ditch and grade the roads in a proper manner—he giving bond and security for an efficient and faithful performance of his duties. This plan would doubtless cost much more at first, but by having high road beds graded and thoroughly drained, it would prove a matter of economy

and saving of time in the course of two or three years. Because, when good, high and solid road-beds were once established, it would require but little labor to keep them in repair and in first class condition; the travel would be unobstructed throughout the entire year; few wagons or other vehicles would be broken down; and full loads could be hauled to and from the marts of trade. If a special tax should not be levied for said purpose, instead of calling out so many hands liable to road duty under the existing law, then, at least, get the improved implements mentioned so that we may expedite work, and at the same time have the grading and draining performed in a substantial and permanent manner. One road machine, drawn by a good team in the hands of a man of good judgment will do more and better work than twenty men under the present system. Let us have a change of some kind; because a country without good solid roads cannot be prosperous and progressive. The "old ruts" necessarily impede travel; the "old bogs" stop the "wheels of commerce," and much of the fruits of honest toil will be lost in the "mire" before reaching market.—*South-ern Farmer.*

Irrigation.

IRRIGATION.

The interest in irrigation has been increasing rapidly in the last decade of years, in what are known as the Western States and Territories. The legislatures of the several states have enacted laws in the interest of irrigation and the Agricultural Department at Washington has made a special department in this interest.

While it is true that there are millions of acres of agricultural lands, now arid

and nonproductive, that may be brought into profitable use for agricultural purposes, thus making homes for the many thousands who are going to the Great West, it is also true that underdrainage has done as much or more, in developing the material resources of the Central States, in the North especially, yet little if anything has been done in the past by the United States government to even recognize the importance of the drainage interest. Indeed it is very probable that there are members of Congress that have not heard of what has been done in the reclamation of the richest lands now under cultivation in the States of Ohio, Indiana, Illinois, Michigan and Iowa, and in other States valuable areas have been reclaimed. The legislatures of the several States named have been slow to recognize the importance of the drainage interest, by needed legislation to carry forward the work. And what has been done is liable to be undone by each recurring legislature. No committee or commissioners have been appointed by Congress to investigate and report upon the drainage interests, notwithstanding the fact that there are millions of acres yet to be reclaimed, that have an agricultural value far in advance of some of the lands which it is proposed to bring into cultivation by means of irrigation. Besides, there is no improvement of a general character, with so many attendant benefits in an agricultural line, that is so important as a sanitary measure. Vast areas of land in the States named, before being underdrained were known as malarial districts, where fever and ague and kindred ailments were the common lot of almost every inhabitant, are now known as the most healthful districts of country since being reclaimed by means of open and under drainage.

When this sickly condition of things existed no one was found to rise in his

place in the halls of legislation and plead for the fostering care of State and Nation to forward the drainage interests, embracing so much for the public good.

However, we are not disposed to hinder but rather to encourage the good work of irrigation, where it will conserve the public interest.

Drainage and irrigation are two twin sisters that should go hand in hand—drainage to reclaim the best agricultural lands on the continent and recover the health of the people thereof, and irrigation to make the arid lands blossom as the rose.

Further, we believe that in the near future under water-ways, a few inches below the surface, so as not to interfere with the surface cultivation, will be the best method of conserving and distributing water for the use of growing crops and the aeration of the soil.

We think it advisable to give the "irrigation of the soil" a place in the JOURNAL, hoping thereby to aid in the general development of our country's resources.

Irrigation News Notes

An Irrigation Convention was held at Huron, S. Dakota, April 3d, to send delegates to the Inter-State Irrigation Convention held at Topeka, Kan., on the 14th.

There are eighteen counties in South Dakota that are already demonstrated to be in what is known as the "Artesian Belt." Wells are being put down as rapidly as the means and help can be commanded.

The Caprice, Farnum, Neb., says the Ogalalla Power and Irrigation Company has succeeded in placing a loan of \$50,000 on their canal in that county and that the company will extend the canal down the river to Paxton.

At Indianola, Neb., a survey is being made for an irrigation canal.

The *Atchison Champion* suggests that next to irrigation, what western Kansas needs is deep plowing as a protection against droughts.

An artesian well is being put down near Garden City, Kan., to test that section of the State in the interest of artesian well irrigation.

The North Dakota legislature has passed an act to encourage and promote the interests of irrigation in that new sister commonwealth.

The Columbia Valley Irrigation Co., Washington., are incorporated with 1,000,000 Capital, to irrigate a vast stretch of canal below Unnatilla.

The Irrigation Inquiry, Department of Agriculture is gathering material for an exhaustive monograph on the "Laws of water and its distribution," which will be a valuable document.

The Platte Valley irrigation canal is booming away up about Court House Rock, in Cheyenne county. There will be several hundred acres of prairie broken under the ditch this summer.—*Omaha Republican*.

The *Minneapolis Tribune's* Special from Aberdeen, S. D., says: "Engineer Nettleton of the government irrigation survey has arrived to report on the advisability of establishing an experiment station and irrigation school near the city. Business men have offered the government the use of 160 acres of the Beard artesian farm and necessary water. While as yet non-committal, it is believed he will report favorably, and that practical men from Colorado will be sent here to superintend the cultivation of crops and instruct the farmers in the judicious distribution of water."

HURON. S. D., April 9th: Mr. Baldwin, State engineer, has already located twelve artesian wells under the Melville law, and petitions have been sent in for twenty others. He predicts that 100 wells will be put down the present season. The Chicago & Northwestern and the Chicago, Milwaukee & St. Paul railway companies will transport artesian well machinery and material free of cost, when properly certified to by State irrigation officers.—*St. Paul News*.

The *Omaha Bee*, of Omaha, Neb., says: "As an illustration of the rapid development, attention is called to the Alsesandro irrigation district of 25,340 acres, the Pasadena (Cal.) *Star* says: 'Six months ago the land in that district could not be sold for \$10 an acre, and without irrigation actual settlers could not afford to take it as a gift. As soon as it was decided to district and irrigate the land, sales commenced, and up to date 8,400 acres have been sold for \$660,000 in ten and twenty acre tracts, mostly to actual settlers, and the land is selling rapidly to-day for \$120 an acre. If this increased valuation in that one district could appear in the assessment roll, it would show an increase in that one district alone of \$2,787,400, and a State tax levy of 50 cents on \$100 would give the State an increased income of \$13,987 a year.

ANNIE AND I,

OR

Josiah Sims Story About Making and Using Drain Tile.

It is high 12 as we enter the livery stable of the Stewart Brothers, in the county seat of S—— County, —— State.

"How are you, gentlemen? Can I get a horse and buggy to drive to the Valley, twelve miles? It is now after noon, I want a good stepper, for like Horace Greeley, I must be there by 2 o'clock."

"We've got him for you, and will have him out in a few minutes."

True to their promise they drove out a beautiful dappled gray horse, with an arch neck, small ears, clean head, with a clear eye. We were soon in the buggy and the lines handed to us, we bid them the time of day, saying:

"When we get back you will see us,"—laughing.

"Very well keep him till the campaign is over if you wish."

The horse was indeed a splendid goer, he skipped over the road with a speed which was delightful on that October afternoon.

We were unacquainted with the road, only being informed that it led directly to the Valley. Every farm and farm house, the grazing herds and fields of corn and grass lands, were objects of interest as we sped by them.

A DRAINAGE ENTERPRISE IN FLORIDA.—The *Times-Union*, Jacksonville, Fla., says that Dave McPherson and a party of capitalists have formed a company to drain Lake Tracy. They have bought ten square miles of the richest muck land and expect to spend \$20,000 on it. They will have to cut a canal from Tracy to Spring Creek, a distance of four and a half miles. The canal will be thirteen feet deep in the deepest cut. They expect to put a large plantation in cane and rice. Such land as this is sold on Lake Apopka for \$300 per acre.

We have traveled some five or six miles, when we come to a tile works by the roadside. The building is two stories in height, painted and surrounded with trees and enclosed with a neat board fence, except the side next the road. A little further on, a hundred yards, perhaps, is a neat farm house, with outbuildings all painted and orderly in appearance. We see a man standing in the door of the factory. We rein up our horse near the door with a "How

do you do, sir," when to our astonishment he called us by name.

"You have the advantage of us, sir, to know our name and we not able to call yours."

"Oh, I saw thee at a drainage convention. My name is Josiah Sims," said he.

"Well, Mr. Sims, I am glad to make your acquaintance. You seem to be prosperous. I should be glad to stop and ask you many questions if we had time, but I am on my way to the Valley. I am billed for a speech there at 2 o'clock and must not delay."

"Yes, I learned that you were to be there this afternoon and thought some of going myself," said Mr. Sims.

"Why not get in the buggy and go right along," we said.

"I suppose I could, but I have my working clothes on," said he.

"That makes no difference. Get in, Mr. Sims," we said.

With a word to his men, he was soon in the buggy and together we are speeding along towards the Valley.

"Now, Mr. Sims, tell us all about how you have succeeded in your business."

"Call me Josiah, plain Josiah Sims," he said.

"Perhaps you are a Friend," we replied.

"Yes, I belong to the Friends' meeting at F——."

"Very well, I will call you by your given name," we replied.

"It is rather a long story if I should tell thee all."

"Let us have it, Josiah."

"When Annie Mills and I were married, over ten years ago, I had six hundred dollars and a team of horses, and Annie had seven hundred and eighty-three dollars. We agreed then that what was hers should be mine, and what was mine should be hers as well, and we have run a partnership concern. My money is her money and hers mine.

The forty acres where our house and factory are standing was offered for sale about the time we were married. There was a small tile factory (horse-power) on it. It was not a very tidy looking place then and not as much so as it should be now."

"It is a very nice house, Josiah, good enough for anybody," we replied.

"Annie and I have done a great deal of hard work thee may well believe."

"We have no doubt of that fact," we replied.

"There was a small tile mill, a one story drying shed, and a small open top kiln. I had worked in a factory about four months when twenty-three years of age, so I thought I knew all about the business. As soon as we were settled down in our nest I began to make tile and cultivate about twenty acres of ground that had been cleared. To my astonishment the clay was not like that where I had worked. It was tender, cracked badly in drying and burning. Do as I would—the shed was open—the tile would crack. From the mill to the yard I would lose almost half, sometimes. The pile of bats was almost as large as the pile of good tile. The clay burned unlike the other. After a time I found that I must make my drying shed tight, exclude the air and wait until my tile were bone dry before setting them in the kiln, which would require more drying room, which I built temporarily onto the old shed. In burning I found, that the watersmoking should be done slowly, very slowly, but continue right on raising the heat, until the tile was burned hard enough. I had considerable trouble for a year or so about the corners of my open top kilns, to get the heat out to them and sometimes on the side. I think it was the second year that I got hold of a copy of the DRAINAGE JOURNAL and subscribed for it and have taken it

ever since. I read in the JOURNAL, that by covering the hot part of the kiln on the top with clay or sheet iron, the heat could be driven to the cold spots. I tried it, and had no difficulty about driving the heat to the corners and sides. After that, I built another open top kiln and used the two open tops until five years ago, and I burned excellent tile in them. I think it was the first year I took the JOURNAL, that I read about some one using sawdust, mixing it with the clay to prevent the cracking of the tile. At first I did not believe it, but as there was a saw mill near by, I concluded to try it, and to my surprise it was so—the tile did not crack anything like as badly in drying, and they dried in much less time and required less time and fuel to burn them. They may not believe it, but I am sure that that suggestions in the JOURNAL have been worth a thousand or two dollars to Annie and I. Afterwards, I saw that floor salt from pork houses was recommended to keep tile from cracking and I have used it—mixing the salt with the clay when the clay is pitted, but I find that the tile dry slower but seldom see a crack. In the fall season, when there is likely to be a freeze, I put salt in the clay to prevent freezing, if a cold snap should come before they are burned, besides I think that the tile have a deeper red color when the clay is salted.

"My clay works much better if I have it spaded up in the fall to a depth of about four feet, which is about as deep as it will work well, it is tougher and less liable to crack, and pugs better. I think that the more clay is worked the better it will be to dry and require less time to burn it. They may not believe the latter, but with my clay it is true. By weathering, disintegrating, and pugging thoroughly, it takes less time to burn, I think, to make a good, solid body

tile, I am sure of it. After learning my clay, I had the thickness of the wall of my tile reduced quite one-fourth, since I dry and burn in less time and I claim to make the best tile that are made in the county.

"There may be clays that work best from the bank, I do not dispute it, for there is a great difference in clays, but my clay works best after it is weathered and well pugged.

"Five years ago I built my present factory and put in steam power and disintegrators. I use a slat floor, that is all, no stalls or any kind of shelving."

"How do you set your tile to dry?" we inquired.

"That depends on the sizes and weather. When the weather is favorable and the sizes are small I often set them four tiers high; that is, I set one tier over the floor and let them set or become solid, then set another tier, and when the second tier is solid enough then a third and sometimes a fourth, but, generally, I set them two and three tiers high. My slats are three inches wide and half inch apart. The large tile I handle with pallets."

"Do you have any trouble with your large tile cracking when you dry them?" we asked.

"We did until I saw the suggestion in the JOURNAL that saw dust sifted on the boards before the tile were set on, would serve to let the tile slip on the board in drying, without cracking. I tried it and it works well. Sand will do, but not so well, I think."

"How large tile do you make?" we asked.

"Sixteen inches now. There is a brisk demand for large tile to close up open ditches, for road culverts, etc."

"Do you use them for road culverts," we inquired.

"Yes, if they are placed deep enough

below the surface and are not too deep, so as to fill with water and freeze so as to break them, and bank up the ends well, they are as good for culverts as could be wished."

"How do you dry your tile?"

"We use steam pipe, under the lower floor, and use the exhaust steam. We do not run all the year, but by using steam pipe we can control the drying, begin a month earlier in the spring and run a month later in the fall. When we have a very cold night, we use live steam. By the use of steam we need not depend on the weather.

"We have built two down-draft kilns and they work very well, but we had to learn how to burn them. After all, there is not so much difference in kilns as some people would have us believe. The important thing, is to know how to use what we have to the best advantage. True, we like to have the best, if there is any best, but we should learn to use what we have to the best advantage."

"How have you succeeded in selling?" we ventured to ask.

"Oh, well, there is quite a history about that. I fear I shall weary thee with so much talking."

"Not at all, Josiah, we are very much interested in your talk," we replied.

"Well, at the close of the second year, Annie and I had a big pile of tile on the yard, for a one horse factory, though we worked two horses, but we called it a one horse factory. Annie kept the books, and does yet, I bring her the statements and she makes all the entries. She writes a better hand than I do, and knows how to keep the books. She has been a help mate indeed. As I said, we had our yard covered with tile and the sales were poor. We talked tile, but the people had to have time to think. Annie said, 'Josiah, we can't do any better, I am thinking, than to put some of

these tile in our own land. What does thee think about it?' We had put in three lines of tile in the lowest places and had not thought of doing any more for a while.

"'Why not do some thorough work—how can we expect our neighbors to underdrain thoroughly unless we show them what it will do?' was Annie's argument." Pretty good, don't thee think?" said Josiah, looking at us with a smile."

"Yes, we think she had the best of it, or physician heal thyself argument," we replied.

"At it we went, I bought a level and took a level of the land. I worked a day or two learning how to use the level and target rod, but I got at it pretty well, found where it was best to lay the drains, where the outlet should begin and then where to lay the mains and submains and lateral drains, and the depths.

"Thee may not think it, but I got so interested in the work that I got Annie to put it all down on paper where every drain would be when completed, setting my grade stakes at points where they would serve to show the plan for future work, for we could not do it all at once.

"We determined to drain ten acres that fall and winter, which would include the outlet and large mains as far as they would extend on the ten acres. We hired two men to help do the digging. I hauled the tile and did the laying of them. The work was completed early in the spring. We had put in on the ten acres 526 rods of tile including the mains."

"How deep did you lay the tile?" we inquired.

"The mains were over four feet deep and the laterals generally about three and a half feet deep or more."

"That was deeper than your neighbors laid them," we suggested.

"Yes, from twenty to thirty inches was

the depth they generally laid theirs, or what few they had put in. Some of them said we wouldn't hear from ours, they were so deep. The lateral drains were laid three rods apart. It took three years before the tile worked to their full capacity, in fact, it takes three or four years for the soil and subsoil to become open and porous sufficient to take up a rainfall and not allow it to run off over the surface. Since we have underdrained the entire forty acres, which we finished five years ago, it is a remarkable rainfall that passes any of the water off over the surface. The earth just drinks up all ordinary rains, as fast as the water falls, and passes it through the drains as clear as crystal.

"But I want to tell thee about my crops. The first ten acres I sowed to oats as I said, then to wheat and then to clover and then to potatoes. After turning under a crop of clover, we had 265 bushels of marketable potatoes to the acre. We sold 2,500 bushels on board the cars for 33½ cents per bushel—over \$800. Since that yield we have had ten acres in potatoes each year, and we have followed about the same rotation of crops with each of the fields, and, the fact is, that we have made as much money off of our land since we underdrained it thoroughly, as we have made from the tile factory, and our neighbors have become interested in the drainage of their lands. We have our orchard thoroughly tiled—a line of tile between the rows of trees, and the same is true of the small fruit garden. Every foot that we cultivate is tile drained. We set half an acre every year in strawberries, that is, one half we set and another half we have in bearing, and another half in clover to turn under to set the next year. We send the strawberries to the city, the best of them that we don't eat. Our receipts from strawberries last year was

over \$250. The fact is, the farmer that uses tile, if he will use them right, gets the best end of the bargain."

"But to get them to use them right, is the question," we replied.

"Yes, thee is right, but example is better than precept. We sell tile to go eight and ten miles."

"Do you have any competition? We know you have when we come to think of it, for there are a dozen tile factories in the county," we said.

"Yes, we have competition. At first they began to cut prices, it was the third year after we began. I was discouraged, but Annie said, 'Do not be discouraged, Josiah, if thee does not sell the tile, thee will have them, they will not ret. We will go on making and use ourselves, if one thing don't pay another will, and we will take pains to make the best tile in the county and have our own prices and sell at our price, or keep the tile.' When we turned our attention to our own land it didn't seem to matter whether we sold or not. Then our trade began to grow and people got so they would come and get the tile without inquiring the price until they paid for them, and we have had no trouble of late years about prices. Others sell lower, so they say, but we make the best tile and handle them carefully and sell all we can make. There are a number of farmers in our neighborhood that are draining their land thoroughly, and it will be so, friend B—, as soon as people learn the benefits to be derived from thorough work in drainage, they will do more underdraining.

"Too much can hardly be said in thy favor for the work thou art doing in educating the people. But here is the Valley. Won't thee drive back to my house after speaking? I wish thee would. Annie would be so glad to see thee and talk with thee. Say 'Yes.'"

"We will, Josiah, if we can make it suit," we replied, and reined up our horse to dismount and hitch.

The speaking over, sure enough we turn our horse's head back toward the home of Josiah Sims. Again we find him an interesting talker on other subjects, and, in a short time, we alight from our buggy at his and Annie's home. They have no children of their own, by birth, but they are raising two with as much care as if they were their own blood.

We examined their plans of drainage, saw the outlet, looked into their catch basins and saw the soil and the evidences of good crops of fruits, vegetables and cereals; the corn looked as if though it would make 75 bushels to the acre. An abundance of everything, with the best cows, horses, hogs, chickens, etc., and everything as orderly as could be desired. At the table we have a liberal supply of fruit and the best of eatables served on a snow white table cloth.

All praise to Annie and Josiah Sims. As Josiah said, so did Annie say. They had but one purse and drew from it as they had need.

Josiah laughingly said:

"I have no whiskey or tobacco bills and Annie is pretty temperate, so that neither of us are ashamed to see how the money goes. We help the many benevolences, the church and worthy poor, and we are glad to be able to do it."

Annie and Josiah could get rich on their tile drained forty acres, and make more money off of it than some do from a half section of land.

"The lives of others do remind us,
That we can make our lives sublime,
And departing, leave behind us,
Footprints on the sands of time.

"Footprints that perhaps another
Sailing over life's solemn main,
A forlorn and shipwrecked brother,
Seeing, may take heart again."

Brick and Tile Notes.

J. P. Walls, Carlisle, Ind., is manufacturing both tile and paving brick. He claims that he can make an excellent paver.

The Wataga (Ill.) Pressed Brick and Tile Co. shipped nine carloads of paving brick to Cedar Rapids, Iowa. The manufacturers claim that their pavers are a No. 1.

The Oil City (Pa.) Brick and Tile Co. has applied for a charter. The Grant Works at Two Mile Run have been purchased and the company will manufacture paving and building brick.

A superior quality of clay for the manufacture of pressed brick, tiling and paving brick has been found in large quantities near Keokuk, Ia. A company will be organized which will commence the manufacture on a large scale.

The American Brick and Tile Co., whose plant is located along the Delaware, a short distance above Philipsburg, N. J., will shortly add to their works a plant for enameling brick. All enameled brick used in this country are imported and this company claims that no company other than theirs, in America, manufactures the kind of brick that may be enameled.

A New Catalogue. The Jackson Grade Level Company have recently published a new catalogue of their levels ranging in price from \$12 to \$25. This well known level has had a large sale. It is a cheap level, but well adapted to the use intended. Those having much draining to do can, by the use of a level, frequently economize the work by ascertaining the level of their lands first and add much to the general efficiency of the work. The non-use and use of a level in drainage is the difference between guessing and knowing a thing. Write the Company for a catalogue.

The Drainage Journal.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete; you will have use for many things published and the volume complete will make a valuable book

J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.

SUBSCRIPTION RATES.

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten ".....	8 00
Single Copies.....	10
Send for rates for larger clubs.	

TO ADVERTISERS.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile. It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers. It is the best possible medium for those having tile machinery, brick machinery, kilns, fire brick, engines, ditchers, clays, tile yards or second-hand machines for sale, to advertise in.

The rates of advertising are reasonable.

ADVERTISING RATES.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1. Twelve lines Nonpareil type make one inch.

Liberal discount for longer time and larger space. Transient advertisements must be paid for in advance.

For large advertisements address the publisher for terms.

THE TILE TRADE.

The word from tile manufacturers is that they have quite generally had a good trade. At Rushville we called upon Matthew Dawson who is the owner of the Caldwell Works. He says the trade has been good. Mr. S. V. Maxfield of Franklin, Ind., made us a call on the 25th of April. He says he did not make enough tile last year to meet the demand of the spring trade, that he has two or three kilns engaged to be taken as soon as burned. The correspondence from all parts of the country is very encouraging to the trade. The very promising prospect of a large wheat crop together with

the advance in prices of agricultural products will add much to the activity of the trade.

HOW MUCH MONEY?

The following question is frequently asked: How much money will it require to build a small factory for making tile? The correspondent will usually say in the way of an explanation that but few tile have been used in the locality where it is desired to build the factory; that they want to commence in a small way and increase the facilities as the demand for the tile increased.

If we ask a large tilemaker how much it will require he will probably say from \$5,000 to \$10,000; but this does not meet the case in hand. We do know that factories have been built and put into operation for as many hundred dollars. They were small, yes; but they served their purpose for the time.

We would esteem it a favor if some of our experienced correspondents would send us a brief outline of factories that can be built at a minimum cost and embrace conveniences and facilities for making tile that will embody efficiency and economy.

In sections of the country south and west they very much need to establish tile factories to manufacture tile and they would if a well digested but inexpensive (comparatively speaking) plan was placed before them. We will take a pleasure in publishing one or more outline plans for the benefit of some of our readers who have had no experience in the business.

LARGER SIZES OF TILE.

There is a growing demand for larger sizes of tile. The organization of drainage districts, the practicability of making large tile ditches do the work of open

ditches, and the mistakes of the past in laying tile that were too small, which it has been found necessary to take up and replace with larger tile, has increased the demand for larger tile to an extent not anticipated a few years ago. Many of the tile machines in use are not adapted to the making of sizes sufficiently large to meet the demand. Many of these machines are being replaced with machines capacitated to make the larger size. A few years ago an eight-inch tile was thought to be large but the sizes have been increased until eighteen and twenty-inch are quite common.

In the manufacture of large tile there has been a very great advance. Some of the devices for handling tile from the mill to the drying room and for turning in drying, are very ingenious and facilitate the work very much.

Quite a number of tile factories run on large sizes, making a specialty of this demand. Other factories make all sizes common to the trade. We have heard of many changes in machinery so as to include the manufacture of the large sizes and many more changes are contemplated.

THE SAMPLE BOOK.

It is a fact that a great deal of study is now being put upon the advertising pages of our leading periodicals. Experts write advertisements, the best artists design illustrations, and it is a matter of considerable interest, therefore, when one of the leading advertising firms of the country announces that they have published a sample book, in which they show 200 or more different advertisements they have written and designed for their customers. Alden & Faxton, Cincinnati, Ohio, well known in the advertising field, have just published a book with this title, and will send it on receipt of six cents in stamps. The collection is quite unique and shows what versatility there is in the American mind, regarding the wants and necessities of people who read newspapers. In addition to the advertisements, information and hints are given to advertisers, whether they are old and experienced, or whether they are just starting on the road to fortune, with the newspapers as their capital.

HE WORRIED ABOUT IT.

"The sun's heat will give out in ten million years more,"

And he worried about it;

"It will sure give out then, if it doesn't before,"

And he worried about it,

It would surely give out, so the scientists said

In all scientific books that he read,

And the whole mighty universe then would be dead,

And he worried about it.

"And some day the earth will fall into the sun,"

And he worried about it;

"Just as sure, and as straight, as a shot from a gun,"

And he worried about it;

"When strong gravitation unbuckles her straps

Just picture," he said, "what a terrible collapse!

It will come in a few million ages, perhaps,"

And he worried about it.

"The earth will become much too small for the race,"

And he worried about it;

"When we'll pay thirty dollars an inch for pure space,"

And he worried about it;

"The earth will be crowded so much, without doubt,

That there'll be no room for one's tongue to stick out,

And no room for one's thoughts to wander about,"

And he worried about it;

"The Gulf Stream will curve, and New England grow torrid,"

And he worried about it;

"Than was ever the climate of southernmost Florida."

And he worried about it;

"The ice crop will be knocked into small smithereens,

And crocodiles block up our mowing machines,

And we'll lose our fine crops of potatoes and beans,"

And he worried about it;

"And in less than 10,000 years there's no doubt,"

And he worried about it;

"Our supply of lumber and coal will give out,"

And he worried about it;

"Just then the Ice Age will return cold and raw,

Frozen men will stand stiff with arms outstretched in awe,

As if vainly beseeching a general thaw,"

And he worried about it;

His wife took in washing (a dollar a day),

He didn't worry about it;

His daughter sewed shirts, the rude grocer to pay,

He didn't worry about it.

While his wife beat her tireless rub-a-dub-dub

On the washboard drum in her old wooden tub,

He sat by the stove and he just let her rub,

He didn't worry a bit.

—S. W. Foss, in *Yankee Blade*.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.

GEO. L. PEARCE, Guineys, Va.

FOR SALE.

One Junior Westinghouse Engine, 15 h. p. Has been used for six weeks running a fan. For particulars and price, address J. W. PENFIELD & SON, ti. Willoughby, Ohio.

FOR SALE.

Two New Bremen Tile Machines, one of which has a screen; is a 2 h. p. Size of dies, 2 to 8 in. The other is a 3 h. p.; size of dies from 2 to 12-inch. For prices, address F. M. GARDNER, New California, Ohio.

FOR SALE.

A small, dry land ditching or dredging machine, 1/2 yard size of the Marion make. Can offer it at a reasonable figure. Original price about \$3,000. Can make it a bargain to some one. Will take a part in trade. Address ELLIOTT, BLAICH & Co., Marion, Ohio.

FOR SALE.

One Brewer Tile Machine with dies from 3 to 10 inch. One Wallace Clay Crusher. Both machines are complete and almost as good as new. These machines will be sold very low. For price, etc., address, M. J. LEE, Crawfordsville, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN,
Portland, Indiana.

FOR SALE.

1 ten h. p. Traction Engine,
1 Eureka Tile Mill.
1 Clay Crusher—smooth rolls.
75 Drying Cars—for tile.
For further information, address,
W. D. COVERT, Administrator,
Franklin, Ind.

FOR LEASE.

Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap. F. C. DEVENDORF, Receiver,
244 South Water Street, Chicago, Ill.

See the New Bremen 'ad.' in the advertising department of the JOURNAL.

The Adrian Brick and Tile Machine Co., Adrian, Mich., write us that their business was never better. Write them for a catalogue of clayworking machinery.

If you are contemplating a trip to any point in Missouri, Kansas, Texas, California, or any Western States, call on the nearest agent of the Big Four Route (C. C. & St. L. Ry.) and obtain full information as to rates, routes, and all other matters of interest. The solid vestibuled trains of the Big Four Route, making close connections in Union Depots, offer accommodations and facilities excelled by no other line. The dining car service of the Big Four Route is unsurpassed.

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G. & C. MERRIAM & CO., Publishers,
Springfield, Mass., U. S. A.

Caution!—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

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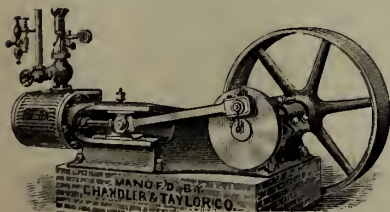
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IGAN AVENUE BOULEVARD, in full view of the
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fact, its Connections and TERMINAL FACILITIES at
all points are superior to those of any other line.

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PEORIA; the Great Central Depot, CHICAGO;
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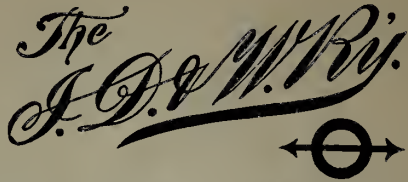
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Quincy	9.50 pm.	10.45 am.
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at 10.10 a.m.

The only line running reclining chair cars
daily between Indianapolis and Keokuk, Ia.,
without change, running through Decatur,
Springfield, Jacksonville, Chapin Bluffs, and
Clayton, Ills. To Quincy, Ills., and Hanni-
bal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street,
Indianapolis. J. G. HOLLENBECK,
JNO. S. LAZARUS, City Ticket Agent.
General Fr't and Tkt Agt.



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No. 2—Chicago Express, daily, except Sun-
day..... 7:30 a. m.
Arrive in Chicago 2:30 p. m.

No. 32—Chicago Limited, with Pullman
Vestibuled coaches, parlor and dining car,
daily..... 11:10 a. m.
Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pull-
man Vestibuled coaches and sleeper, daily 1:15 a. m.
Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.
LEAVE CHICAGO.

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Saturday..... 11:55 p. m.
Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited,
parlor and dining car, daily..... 9:55 a. m.
Arrive in Indianapolis 3:55 p. m.

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Pullman Vestibuled Sleeper for Chicago stands at
west end of Union Station, and can be taken at 8:30
p. m., daily.

Ticket office, No. 26 S. Illinois St.

I. D. BALDWIN, D. P. A., Indianapolis.

JAS. BARKER. G. P. A., Chicago.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others, in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

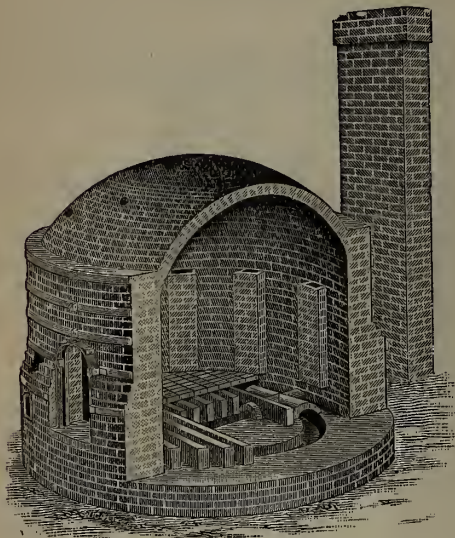
BOX 246, AYLMER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.



"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT LEADS THE WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials. Address Active resident agents wanted.

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock" - New and Improved Brick and Tile Kiln -

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tile makers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

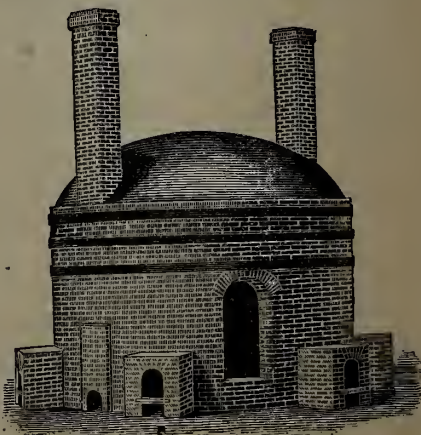
It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

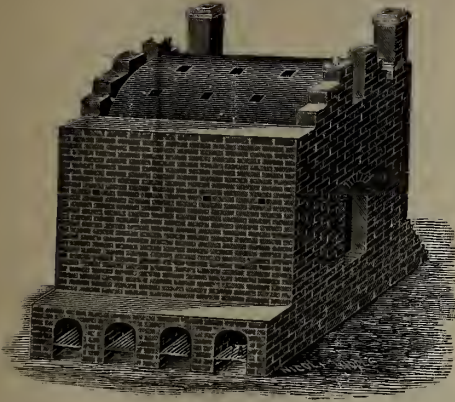
The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address

J. B. GRAWCOCK, Churubusco, Ind.



DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

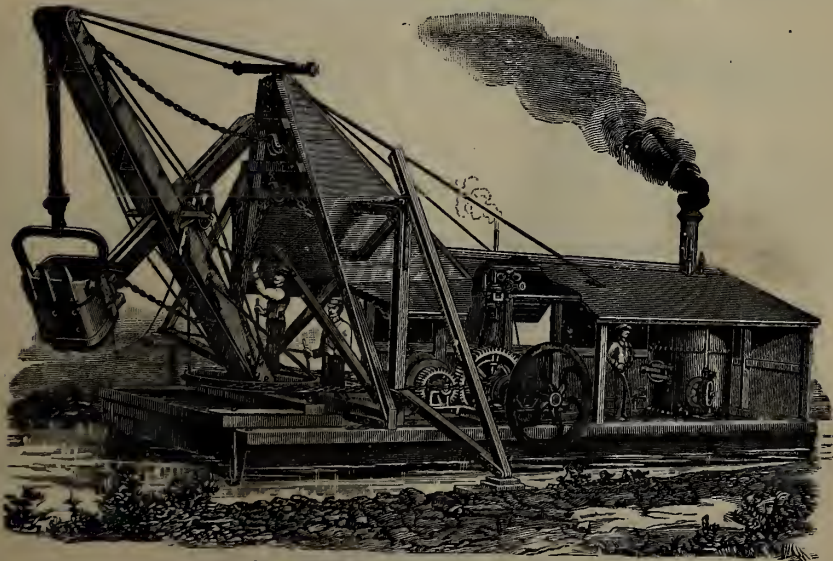
crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

W. E. DAWSON, Agent, Colfax, Ind.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



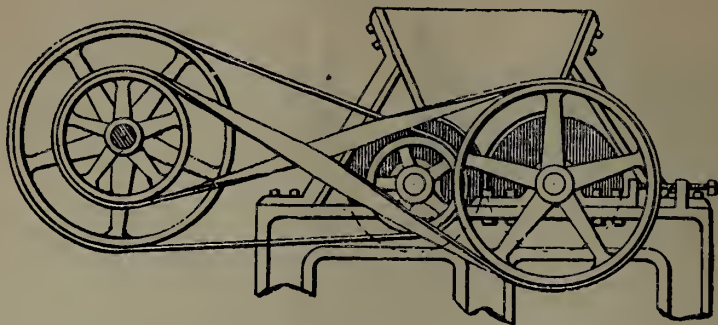
Manufactured by

MARION STEAM SHOVEL CO.,

MARION, OHIO.

THE Crusher and Disintegrator.

PATENT APPLIED FOR.



The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

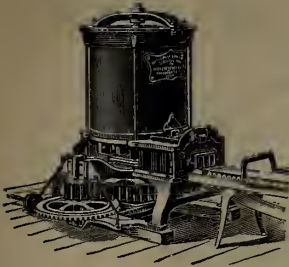
This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

Dry Cars ;
Clay Cars ;
Turn
Tables
and
Kiln
Castings.

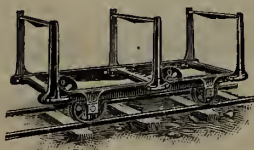


Pulleys ;
Shafting ;
Hangers ;
Barrows
and
Yard
Supplies.

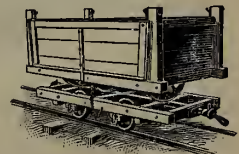
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



(Dry Car.)



(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.

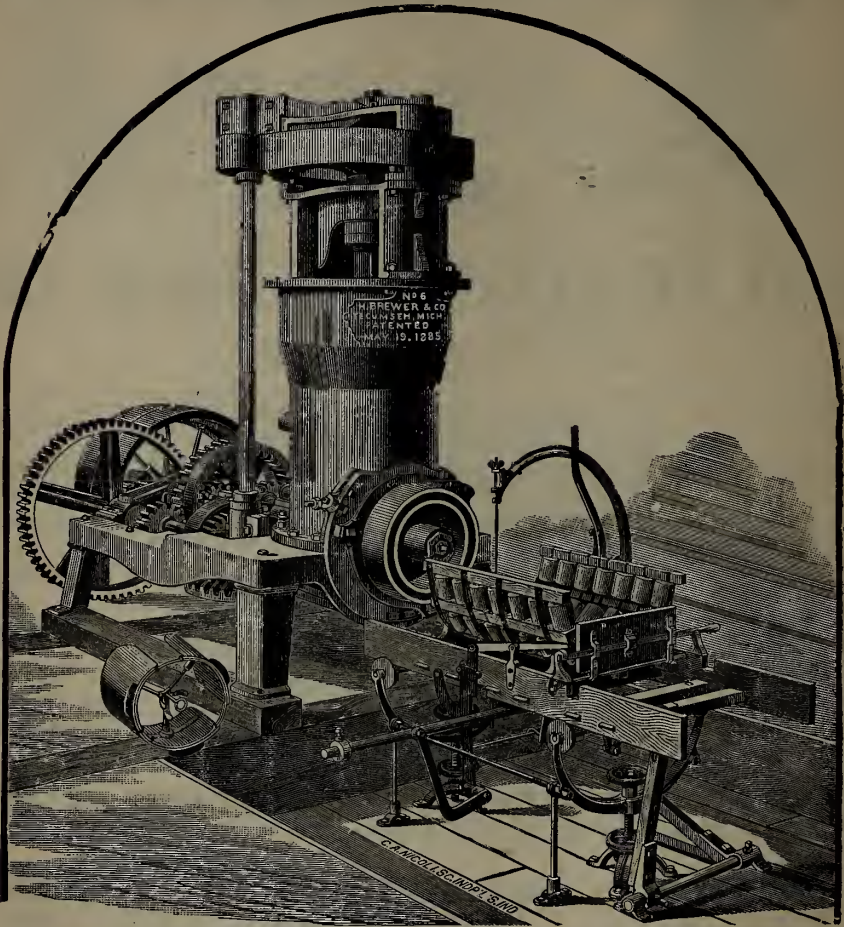


(No. 3 Crusher.)



(No. 7 Pug Mill.)

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile 16½ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, 16½ inches long.

Yours Truly, M. J. Lee.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

Yours Truly, JOLIET MOUND DRAIN TILE CO.

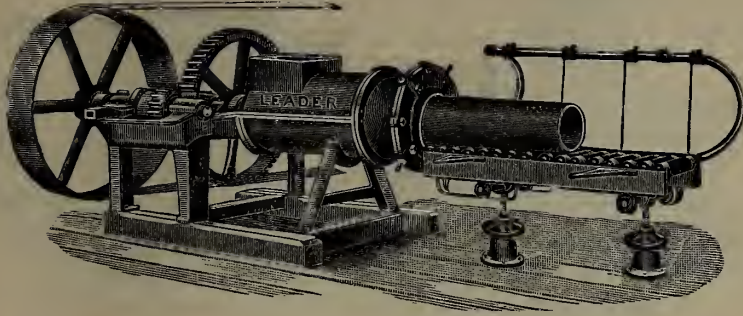
The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

Advertisements.

Brown-Frazier Manufacturing Co.,
PORTLAND, INDIANA,
—MANUFACTURERS OF—
Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,
Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS
FOR
CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



ELEVATORS
FOR TILE,
BRICK,
PACKAGES, ETC.

Roller & Detachable
CHAIN BELTING,
Designed for

Elevators,
Conveyors,
Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

ADDRESS

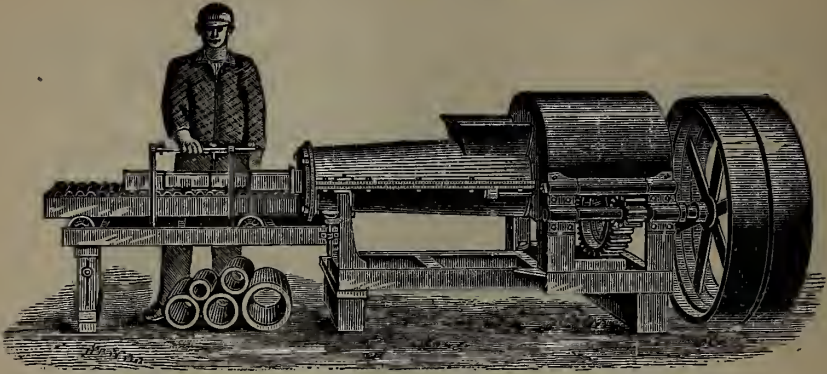
The Jeffrey Manufacturing Co.,

112 East First Avenue,
COLUMBUS, - - OHIO.



KELLS & SON'S IMPROVED Brick and Tile Machines!

"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the backs and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

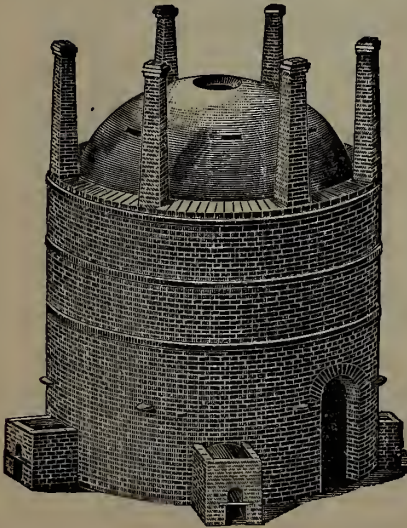
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

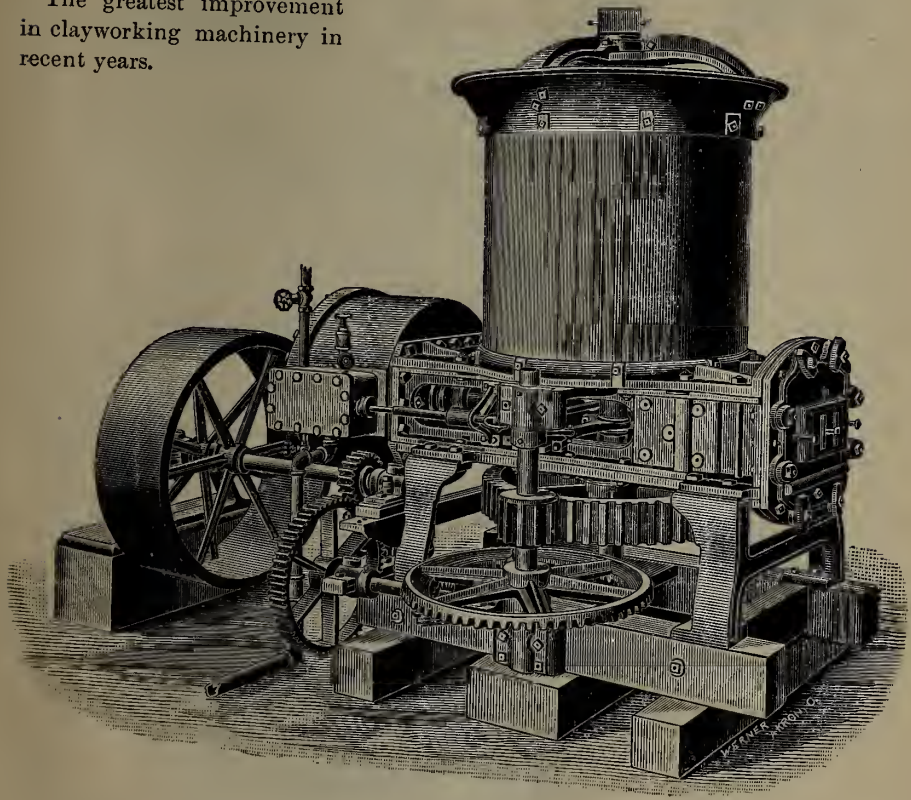
W. A. EUDALY,

CINCINNATI, OHIO

64 Johnson Building,

The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



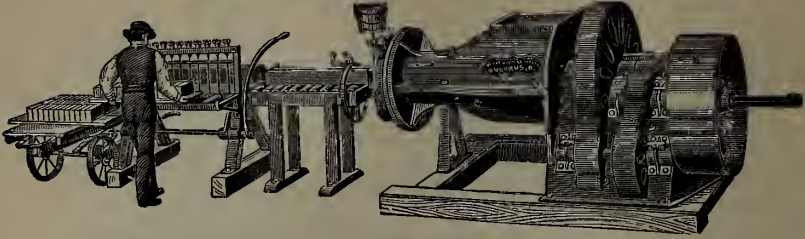
PATENT GRANTED.

For full information and circulars address

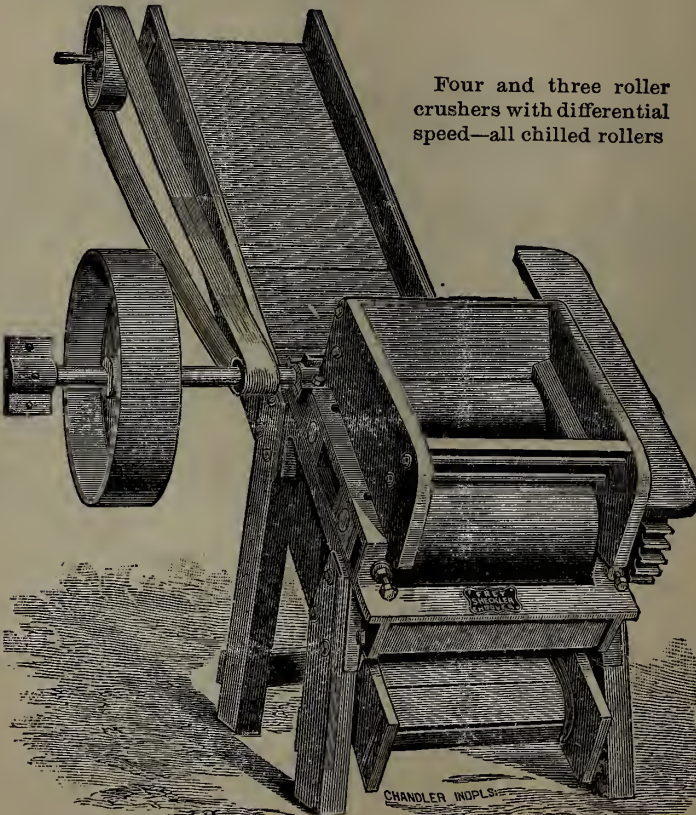
THE NEW BREMEN MACHINE CO.,
New Bremen, Ohio.

FREY-SHECKLER CO.

BUCYRUS, OHIO.



The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.
The Mascot—the lightest running.
The Centennial—the best clay mixer.
We furnish full outfits for brick and tile factories.



Four and three roller crushers with differential speed—all chilled rollers

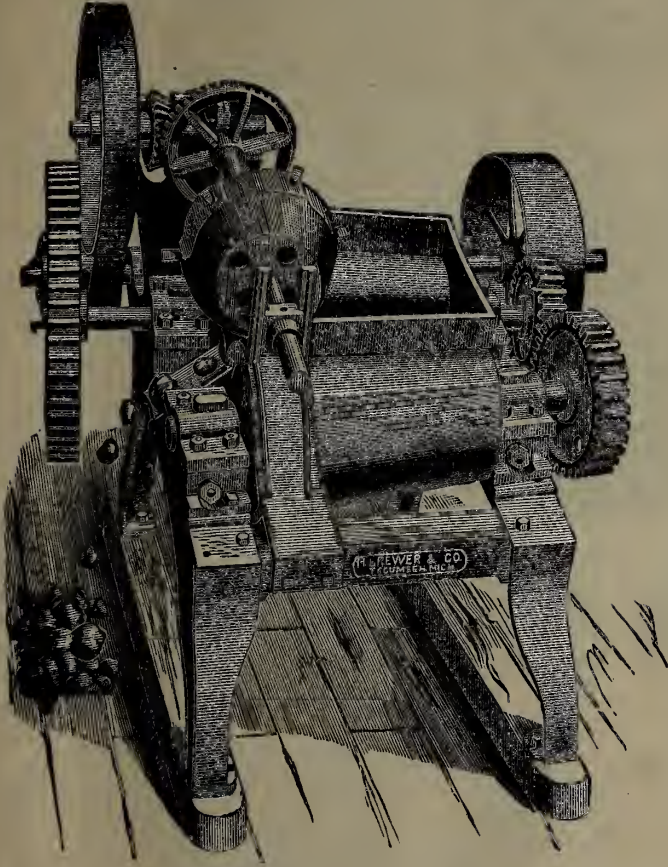
Six Different Brick Machines; Four Different Tile Machines
Crushers, Represses, Kiln Doors, Kiln Irons, Grates,
Brick Moulds, Steam Pipes, Brass Goods, Etc.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.

We make thirteen different patterns of Roller Clay Crushers.
Send for catalogues and circulars to

THE FREY-SHECKLER CO., - Bucyrus, Ohio, U.S.A.

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

The following are among the advantages claimed for this form of construction:

- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

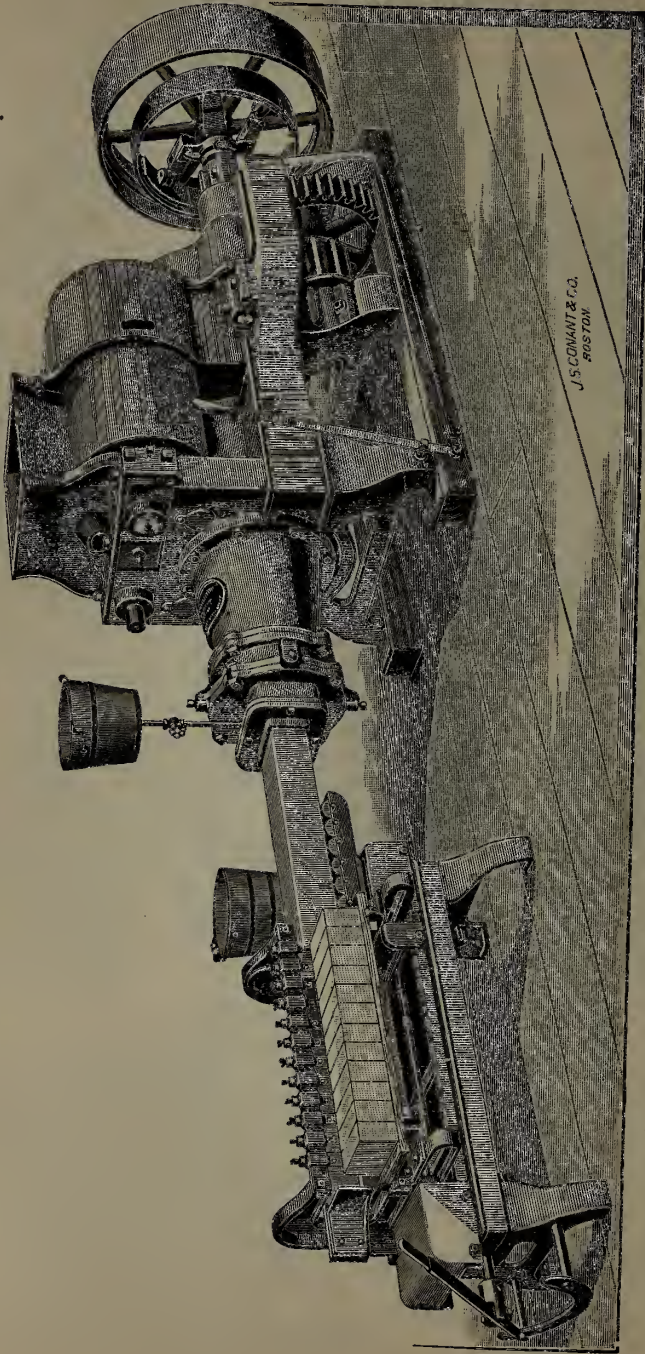
For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



"A" or Largest Size Machine with New Board Delivery Cutting Table.
Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

E. M. FRIESE & CO.,

Mention this paper.

PLYMOUTH, Richland County, OHIO.

BRICK AND TILE MACHINERY.



New Machinery, new Clay Conveyor, new Automatic Cutting Table, specially adapted to cutting paving brick.

Write for Catalogue and information. Address

**Adrian Brick & Tile Machine Co.,
ADRIAN, MICH.**

NEW DEPARTURE TILE MACHINE

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

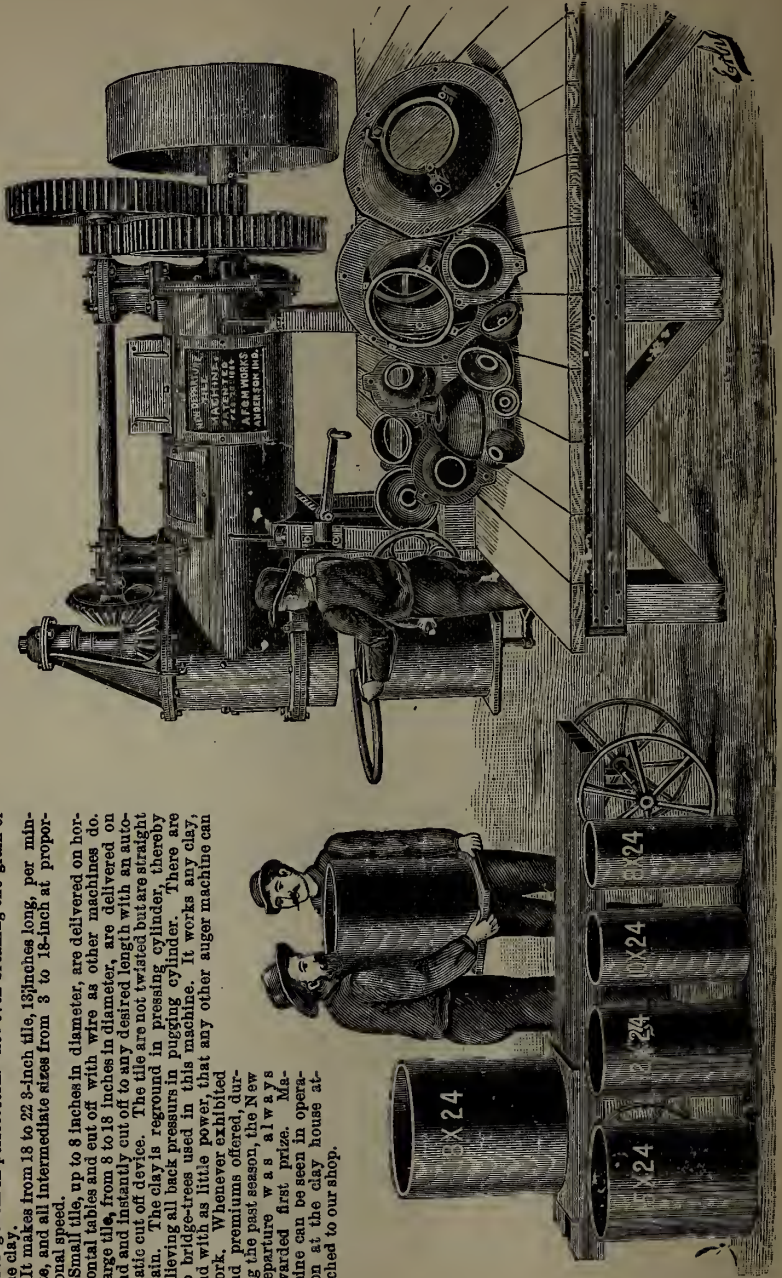
It makes from 18 to 22 8-inch tile, 13 inches long, per minute, and all intermediate sizes from 3 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressures in puging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power, than any other auger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be seen in operation at the clay house attached to our shop.

For full information and circulars, address:—

ANDERSON FOUNDRY & MACHINE WORKS,

Anderson, Ind.



TRANSIT LEVEL

FOR THE USE OF

ARCHITECTS AND
BUILDERS.



FIG. 11.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

T. F. RANDOLPH,
Surveyors' and Engineers' Instruments,

51 West Fourth Street, Room 31.

CINCINNATI, OHIO.

This is a new, light and convenient instrument for leveling and taking horizontal angles without the Magnetic Needle attachment, intended for architects and builders uses.

The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

Price, as shown in the cut with 5 ounce plumb, \$50.00.

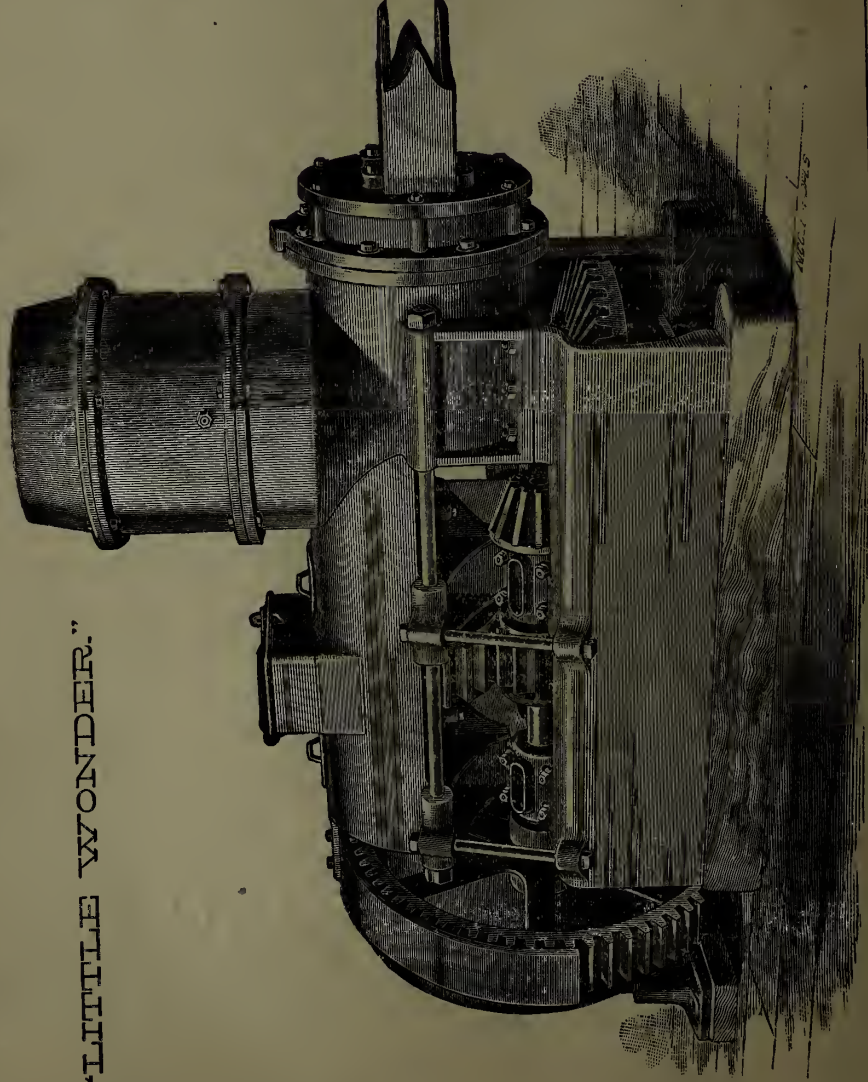
With a more complete tripod, as shown in Figures 2 and $2\frac{1}{2}$ in my catalogue, the price would be \$60.00.

Send for Catalogue.

THE WALLACE MANUFACTURING CO., Frankfort, Ind., U.S.A.

—MANUFACTURERS OF—

"LITTLE WONDER."



LITTLE WONDER TERRA
COTTA LUMBER, BRICK
AND TILE MACHINE.

WALLACE PATENT CLAY
CRUSHERS AND STONE
SEPARATORS.

WALLACE PATENT PUG
MILLS.

PLATFORM SPRING BAR-
ROWS FOR BRICK AND
TILE AND A FULL LINE
OF CLAY WORKERS'
SUPPLIES.

CORRESPONDENCE SOLICITED

22-03
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Vol. XIII—No. 6.

10¢ PER COPY.
\$1.00 PER YEAR.

THE DRAINAGE JOURNAL



JUNE, 1891.

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FARM DRAINAGE,
MAN'F'R OF DRAIN TILE,
PROGRESSIVE AGRICULTURE
IMPROVEMENT OF HIGHWAYS.

J. J. W. BILLINGSLEY
INDIANAPOLIS, IND.

TILE MAKERS' SUPPLIES.



Cast Iron Kiln Cover.

No Down Draft Kiln complete without it.
TILE TRUCKS AND BARROWS, KILN BAND TIGHTENERS, KILN DOORS AND FRAMES, FURNACE FRONTS, LARGE DOOR FRAMES, CAST IRON COVERS, GRATE BARS, ETC., ETC.

Send to

D. J. C. Arnold,
NEW LONDON, OHIO.

For Illustrated Catalogue. [Mention the Journal.]

STEAM DITCHERS

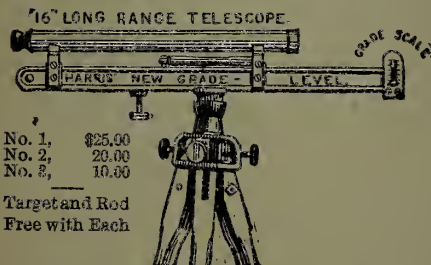
For Steam Tile Ditching Machinery
ADDRESS

The Streator Engine & Machine Works,
STREATOR, ILLS.



PATENTS.

C. P. JACOBS,
Attorney in Patent Cases.
60 EAST MARKET STREET,
INDIANAPOLIS IND.



- No. 1, \$25.00
- No. 2, 20.00
- No. 3, 10.00

Target and Rod
Free with Each

Do you Grade or Drain? If so, you need this Level.

Most Simple, Durable, Accurate.
The Best.

Recommended by hundreds who have used it and some of whom you doubtless know. Their names and addresses, with full descriptive price list and illustrated circulars, sent free on application to parties who mention this paper.

Address **JACKSON GRADE LEVEL CO.,**
We refer to Ed. Jackson, Mich

IMPROVED COAL BURNER



Combined Hood and Hanging Grate Basket. Are in successful use for burning Tile or Brick with coal in Down Draft Kilns without sub-arches or outside furnace, and it is a reliable, satisfactory Grate Basket for burning brick with coal in common Case Brick Kilns

Patent applied for. requiring no outside furnace. For circulars, testimonials, price, address

W. H. WICKERS,

311 English Ave.

Indianapolis, Ind



BEATTY'S ORGANS, PIANOS
\$35 up. Write for Catalogue. Address Dan'l F. Beatty, Washington, N. J.

DONALD KENNEDY

Of Roxbury, Mass., says

Kennedy's Medical Discovery cures Horrid Old Sores, Deep Seated Ulcers of 40 years' standing, Inward Tumors and every disease of the skin except Thunder Humor and Cancer that has taken root. Price \$1.50. Sold by every Druggist in the U. S. and Canada.

THE DRAINAGE JOURNAL

Vol. XIII. JUNE. No. 6.

TILE DRAINAGE.

It scarcely need be stated that there can be no perfect drainage without a free and full outlet, to obtain which is not an easy matter on some of our Western prairies, but, of course, there is an outlet somewhere, if not upon our own land, upon the land of some one else, and we can reach it either through a private arrangement, or under such drainage laws as exist in Illinois. Unless the facilities for carrying off the water are ample, the water will necessarily back up the tile and fill them to a greater or less distance, and in such case it is impossible for the land about the filled pipe to drain. It will contain not only the water that it would if there were no tile, but in addition water that leaks from the drain. The water from the soil gets into the tile through the joints, which may be fitted as tight as their unevenness will permit, but if water can get in in that way it can get out in that way if the tile is filled. To insure perfect drainage the tile never should run quite full. Therefore, the first thing to be sought is an outlet, and very frequently a perfect outlet will necessitate the construction of ditches or the deepening of those already existing. A free flow provided for, taste, if not necessity, will sometimes suggest a little extra labor and expense about the mouth of the outlet, to the end that it may not only

present a respectable appearance, but that it may the better stand the treading of stock, if stock should have access to it. There is something about drain water that makes stock very partial to it, and it will seek it if there is opportunity offered to find it; and in gathering about the outlet, they will soon make a mud hole of it, unless it has a hard bottom. Precaution must be taken, too, against the possibility of injury to the outlet by stock.

Having located the outlet, we next proceed to locate the main drain, and in draining we need to remember all the time the very important rule: Avail yourself of every natural advantage, remembering, however, that angles and short turns in the drains generally should be avoided. Tile should be laid in straight lines or connected by long curves. When these conditions can be observed, the mains should follow the lowest land, that being the course of natural drainage. The advantage of laying the tile in straight lines, or at least not in angles, in the construction, is first found in the increased velocity of the water. On very much of our Western land, the fall is not very great, and anything that will increase the velocity of water is to be sought for. Short curves decrease the velocity of flow. Besides this the mains are constructed of larger tile than the connecting lines are made of, and crooks in the line increase its

length and consequently increase the cost of its construction. But to avoid this we must often make deep cuts through higher land, and it may be the case that so far as expense is concerned, that would involve a greater expense than would be necessary to make a crooked line to follow the course of the low land. There might be one other objection, too, to following such a course. It might prevent the drainage of land that we especially wanted to drain. The determination of just what to do in each case, must be left, therefore, to circumstances, keeping the general rule in view, but remembering that there are exceptions to all rules.

Often no main is necessary. Single lines of tile laid through a flat may afford all the drainage that may be needed. But a thorough system of drainage means mains to carry off the water, and submains and branches to collect the water. This is the only way that flats, ponds and swamps can be thoroughly drained. If the main is large it will itself drain the land for about fifty feet on each side of it, and, therefore, it will require no tile running parallel to it within such a distance. It will be best, we may say right here, if a thorough system of drainage is determined upon, to secure the services of a surveyor, if the land chances to be so level that a fall cannot be readily seen. Having found where and what the fall is, in this or any other manner, construct your main from the outlet to the distance that may be necessary to receive the water from the submains, or the main may be constructed from the outlet to a convenient distance and connected with a silt basin, into which the necessary sub-drains may empty. There are advantages in silt basins, and also some disadvantages, and which are the greater we are hardly prepared to say. Many

experienced men construct them at quite frequent intervals along the drain, and claim that no drainage is complete without them. Others would not have them. Now having your main in position either terminating or not terminating in a silt basin, construct parallel submains to discharge into the basin, if there is one, and branches running parallel to the submains, except when they enter it, which they should do by a long curve as before stated, or if there is no basin, then construct the submains so as to enter the main at regular intervals. Sometimes these submains enter the main at right angles, that is if the main line were laid lengthwise of the field, the submains are placed crosswise. More, usually, perhaps, it is the case that the fall suggests the placing of the mains in a certain position is quite general over the land, and in that case the necessities of the case would prompt the laying of the tile as just described. But here again the conditions of the land on the different sides of the main may be so unlike that both systems may be employed, one on the one side of the main, and the other upon the other. For instance, on the one side there might be a narrow piece of flat land extending some distance from the main, which were best drained by branches running into the main at right angles or nearly so, while on the other side of the main there might be a flat piece lying parallel with it, and which could be more economically drained by a branch laid beyond the limit of drainage by the main, and parallel to it.

We use the term right angle to make our idea plainer, but the fact is that one pipe should never enter another at a right angle. If it is necessary to run a branch toward the main at a right angle, it should be made to curve before reaching it, that it may enter in the same

direction that the main discharges. The reasons for this are apparent. In many things we may not be able to reduce a proper theory to actual practice. Enough has been said about the difference of conditions to already suggest this. But the drainage theories thus far stated are the rules for insuring successful draining, and the nearer we come to complying with them, the nearer we shall get to the most perfect success.

The silt basin may be called a well, located along the line of the drain, or at a point where several drains come together. It may be constructed of either brick or stone and even of plank. The object of using a silt basin in the line of the drain is the collection of the silt or fine earth, which settles at the bottom, and which might under some circumstances clog up the drain. The basin should be provided with a cover, which can be taken off at intervals, and the silt removed before sufficient has accumulated to obstruct the flow of water. We know men who think the silt basin is one of the most important features of drainage, and without which, tile laying can be but imperfectly successful. Upon our Western farms, however, there is little need of the silt basin generally for the purpose of collecting silt, for there is not sufficient difference in the grade to make danger from clogging very great. There is one valuable use of the basin, however, in long drains, and that is to enable us to examine the workings of the drain. In this way we are enabled to see that the drain is in good condition, or rather enabled to see in what section it is not in condition. The silt basin ought to be at least a foot in depth beneath the tile, and when constructed along a main, it should be twelve to fifteen inches in diameter. If the silt basin is constructed at the junction of several mains—and it is often

useful in such positions to obviate the necessity of short turns in the lines—it should have a diameter of about two feet. Perhaps it would be altogether the safest and best to have a silt basin wherever several mains come together, and there is no objection to it in either of the situations named.

As to the depth at which tile should be laid, that must necessarily depend somewhat on circumstances. Whenever the circumstances will admit, tile should be laid pretty deep. Shallow drainage has caused a very large aggregate of nearly useless expense, and a vast deal of disappointment in this country. That the drain must go beyond the reach of frost would seem to be self evident, and that would require a depth of about two feet. Yet there has been a great deal of drainage that did not reach that depth. The advantages of deep drainage are that a deeper soil is made available to growing crops, the effects of drouth are less, at times of heavy rainfall there is more room in the ground for water, which may rise considerably above the drains for a short time without any great injury to plants, and the deeper the tile is laid the less size they need be, for if the rainfall is heavy it may fill the soil with water clear to the surface—if the drainage is shallow—and in order to carry it off in time not to do the crops harm, the tile must be large enough to carry it all off at once, while on the other hand if there is room enough in the soil to hold the amount of water without bringing it to the surface, a smaller tile will have time to carry it off before damage is done. In prairie soil, speaking generally, it has been found from experience that about three feet is the best depth. If we decide upon three feet or three feet and a half, in some places it will run four feet and even more. As before remarked, however, we

must be governed by circumstances. Often the shallowness of the outlets which we must use will prevent us draining at the depth we would like to. But if there is nothing to prevent, the rule laid down here will be found a satisfactory one.

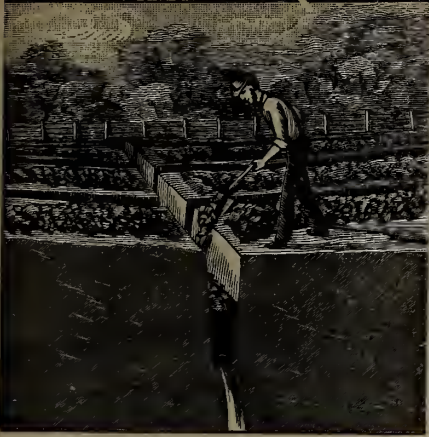
The distance that the tile should be apart will depend upon the character of the soil. In a retentive clay soil they must be placed nearer together than is necessary in ordinary vegetable loam. A gentleman who has had large experience says that in such soil as last named, tile three and a half feet deep and one hundred feet apart, will thoroughly drain it. But the distance will be regulated largely too by the size of the tile and the character of the land lying adjacent to that which we intend to drain. As already mentioned, a line of tile will drain fifty feet each side of it. But it sometimes has more than this to do, as for instance where there is adjoining land that slopes toward the land through which the drain runs. We must take these things into consideration, and in view of all the circumstances, must provide for the removal within twenty-four hours of any surplus water that may fall. As a general guide, the size of the main for a given number of acres under ordinary circumstances, the branches or sub-mains being a hundred feet apart, may be given as follows: For twelve acres, a four-inch tile; for twenty acres, a five-inch tile; forty acres, a six-inch tile; sixty acres, a seven-inch tile. A three-inch tile will answer for five acres. The submains and branches must in size be proportionate to the main, of course. At the upper end of the main or branch, the size of the tile may diminish, as there will not be as much water as further down. The grade must also be taken into consideration in determining the size. A steeper grade requires a less size than one less steep.

The kind of tile to use should be either well burned tile, smooth on the inside, unwarped by excessive heat, and round, or the continuous concrete tile, which is manufactured by means of a simple machine—which has frequently been advertised in our columns—which is operated in the ditch after the latter has been prepared in the usual way. The material used for this kind of a tile is composed of hydraulic cement, lime and coarse sand. These are made into a stiff mortar which is fed into the machine through a hopper, and comes out a continuous pipe. Crevices for the admission of water are made at any desired intervals, with a trowel, leaving the bottom of the tile continuous. The cement will set in a few hours, and will be hard enough to bear the earth. We are very favorably impressed with this style of tile, for it is not expensive and must prove durable.—*Western Rural*.

The Ohio experiment station has made some interesting experiments showing the effect of removing tassels from corn. They were made to test the theory that if the tassels were removed from corn before they have produced pollen, pollen bearing being an exhaustive process, the strength thus saved to the plant would be turned to the ovaries and a larger amount of grain be produced.

From each alternate row of a plot of corn the tassels were removed as soon as they appeared. Briefly, the result of the experiment was that the number of good ears and the weight of merchantable corn were both a little more than fifty per cent greater on the rows from which the tassels were removed than on the others. Here is an experiment which any farmer can easily repeat for himself, and determine whether the work is profitable or not.

Farm Drainage.



EXPERIMENTS WITH TILES.

It is frequently claimed that there is an advantage gained in the efficiency of drains by laying soft tile. The following somewhat exhaustive experiments by Dr. W. I. Chamberlain, in the *Country Gentleman*, of recent date, are apparently conclusive. He says:

"First, I took a four-inch tile, medium burned, and set it on end in a deep pail in plaster of Paris mortar and let the plaster harden, inside and out of the tile. This completely closed the bottom of the tile. I then filled the tile full of water. The water sank perceptibly in the tile with a sort of hissing sound, and the small air bubbles came to the surface as the pores of the tile greedily drank in the water. In eighty minutes it had sunk two inches, but no water had gone through. I filled it again and left it nine hours. It had then sunk half an inch, *but no water had gone through*. I filled it again and it sank no more. Apparently the same capillary attraction that drank the water into the pores kept it in them, preventing its escape.

"I reversed the experiment with the

same tile, still soaked—emptying the water out of the tile and filling the pail all around the empty tile. *No water came through*, and none was absorbed, as the tile was saturated already. I then remembered that water is said to filter through the brick partition of a cistern. The thought suggested itself that perhaps the water first got through the cracks between the bricks and the mortar, and then with water *on both sides* possibly it might go through the brick on that principle of chemical physics known as *osmose*, (endosmose and exosmose) by which two liquids on different sides of a bladder or membrane partition, mix through the membrane, which is impervious to either alone! Or, if not on this principle, I thought perhaps the water on both sides of the tile might relieve the retentive force of the capillary attraction and *let the water through*, while, owing to the greater height on one side, the force of gravity might push it through. The theory seemed all right to explain the alleged facts about cistern filters. But it wouldn't work on the tile! I filled the tile *full* and the pail *half full*, but not a drop would go through, influenced either by gravity, capillary attraction or the molecular attraction called *osmose*. Not the fraction of a teaspoonful could I get to go through in some twelve hours of time, under all the different circumstances. And I may add that in the former experiments together with Prof. Lord, we let the water stand for days in a rather damp basement and not a drop came through. But in a dry wind that evaporated from the moist surface of the tile, the capillary attraction would supply the place of the moisture thus evaporated.

"Now the tiles experimented with in both these cases were simply medium-burnt brick-clay tiles. But if the land is not drained until the water goes

through the walls of the tiles (except in case of flaws or "pin-holes"), it will never be drained. For a tile, so porous that its walls would suck in one-fifth of its interior contents, was so impervious that it would not let the decimal of a teaspoonful pass through in twelve hours.

"So next I addressed myself to ascertaining about how fast the water can get in *at the joints*. I set another four-inch tile on end on the one that was closed at the bottom and was full and saturated; and I held it firmly down while my man filled it by turning in water rapidly from a full pail, and when the tile was even full I cried "now!" and my son and I timed it till it had all run out at the joint—just five seconds!—eight gallons per minute. But Gisborne, one of the earliest and best authorities, figures that with laterals 36 feet apart the drains would remove an inch of rainfall in 12 hours if each tile junction will admit two-thirds of a tablespoonful per minute! And our tile admitted (or let out) *eight gallons* per minute under a pressure varying from one foot perpendicular of water down to nothing, several hundred times as fast as need be.

"I have written pretty fully, in hopes of exploding the old idea that the water soaks through the tiles. Makers of soft tiles seem still to believe it; and some buyers too. Waring and other authorities on drainage state the case correctly. Waring says ("Draining for Profit and Health," page 77): 'They'—*i. e.*, brick clay tile—'are porous to the extent of absorbing a certain amount of water, but their porosity has nothing to do with their use for drainage—for this purpose they might as well be of glass. The water enters them not through their walls but at their joints, which cannot be made so tight that they will not admit the very small amount that will need to enter at each space.'

"Of the 15 miles of tile drains on my little farm, nearly half are hard potter's clay tiles, most of them glazed, and all as hard as a jug or earthen crock. They cannot and do not crumble or flake with the frost even at the outlets where they are constantly freezing and thawing while wet, but the brick-clay tiles at the outlets flake and shell to pieces with the frost. The glazed potter's clay tiles drain the land exactly as well as the porous ones, so far as I can see, for both sorts work perfectly. I have sometimes had the whole bottom course of piles of brick-clay tiles, lying directly on the ground, shell all to pieces in a single winter with our frequent rains and quick freezes and thaws. And so I prefer the hard tiles if they can be had at about the same price. As they are stronger and burned harder, they can be made thinner and lighter than the brick-tiles, and hence cost less for freight and handling. I have just weighed some with the following results:

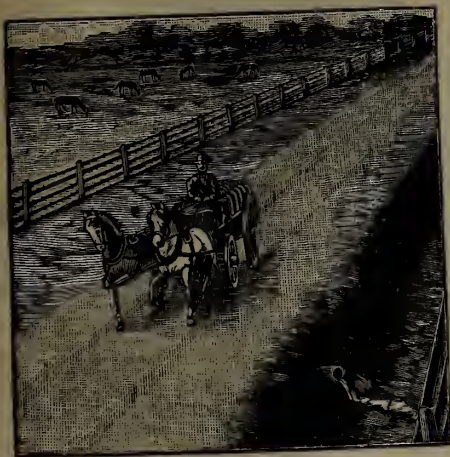
2-inch, soft,	2 lbs.	13 oz.;	hard,	2 lbs.	8 oz.
3-inch, "	5 "	13 "	"	4 "	2 "
4-inch, "	7 "	6 "	"	6 "	8 "

"There is less difference in weight than in size, as the soft ones are lighter in specific gravity; and there is less difference in weight than I supposed until I tested them; also less in proportion in the two-inch ones.

"Still, I think the brick-clay tiles will endure for centuries, except at the outlets, if laid below frost, and if hard burned. Each one should show clear red color and give a clear metallic ring when struck with a hammer, or be rejected."

We shall be pleased to give space to any of our readers who have made any tests in the use of soft and hard tile. We have yet to learn of soft tile freezing at a depth of twenty inches so as to crumble or spawl off. Who has had experience to the contrary.—Ed.

Road Drainage.



DRAINAGE OF ROADS.

Directions for Doing the Work in a Substantial Manner.

Road drainage is not an untried plan for improving roads in Illinois and many parts of Indiana, and I may add that no highway work has given such good results for the money expended as that which is commonly called "tiling the roads." For ten years the practice has been growing in favor, and at every public meeting of highway officers and institutes where road questions are discussed, road drainage receive hearty indorsement as the foundation of all permanent road improvement in alluvial soils. Surface drainage and under drainage should be used together; the former for removing all flood water as quickly as possible from the road surface, and the latter for keeping the soil water away from the base of the road track. The first requisite is a low embankment with well curved surface which is to be kept as hard and smooth as practicable with surface ditches on each side. Tile drains should now be placed at the edge of the base of the

road grade, about three feet deep, and be continued to some good discharging point. Where the road extends through a continuous flat, a line of tile on each side will be found necessary to secure the best results. Where the road is located on ground which is alternately high or has natural drainage, and then flat or swampy, a line of tile on the side where the least cutting will be required may be laid; and when a pond or flat is reached a branch may cross to the opposite side of the road and be continued lengthwise along the base of the grade. This plan secures drainage on both sides where needed, and on one side where it is not so much needed, and also saves the expense of making two deep cuts for the purpose of getting a suitable grade where one cut will serve as well. By using tile of proper quality and size, and laying them properly, we have the best system of road improvement now known, until a good surface covering can be placed on top. I may add that it is found best in most localities to use surface soil for our road embankments. Do not dig up the clay or subsoil and place it on top, but use top soil for road surface as persistently as you would use it for a garden or lawn if best results are wanted.—*Cor. in Orange Judd Farmer.*

TILING DIRT ROADS.

H. C. Middaugh, Clarendon Hills, Ill., writes *O. J. Farmer*: I am in a clay subsoil section—have about 40 miles of drain tile laid for agricultural purposes. My first experience with tiling in highways was on an all clay road and it washed out gullies on each side 3 feet deep. I put a 4-inch drain in bottom of ditch below frost, not less than 3 feet deep (and if ground was uneven, the drain would be deeper in places to have a uniform fall) being sure to have an outlet so that water would run out from

tile under all conditions. Where they were so put in, the washing out ceased and are grassed on the top. Then I tiled the wet roads and they are better than the best untiled at all times of year. These drains should be put outside of the traveled parts of road and where the teams do not go; for traveling over ground makes it pack and undrainable. Never put a drain in the center of a road for effectiveness. I do not think open drains filled with stone or gravel are worth the cost of putting them in. Heavy rains carry the finer soil down and they clog up sooner or later. Tiling road beds will save material enough in making stone and gravel roads to cover their cost—i. e., 12 inches gravel on a tiled road bed is better than 18 inches on an untiled bed. A tiled road can be graded so it can be cut with mower on either side and present a pleasing appearance to travelers, besides paying to the owner in grass.

THE IMPROVEMENTS OF HIGHWAYS

*BY J. J. W. BILLINGSLEY.

There is probably no subject of such general importance, that is talked about daily and almost hourly, about which there is such a diversity of opinion, as that of bettering the condition of our public highways.

There are some points upon which we are all agreed, that is, good roads are desirable and would greatly benefit the country; that we have reached a period in our development when this subject should receive careful consideration. Farther, it is pretty generally agreed that what is done in the future should be of a more permanent improvement than has characterized the work of the past; that what is done should be a part

of the system to be worked out in the future.

We are, also, agreed that such improvements will cost something—will cost considerable. But how the work is to be done, supervised and paid for, there is not an agreement.

Before discussing methods and means let us briefly consider the importance of the undertaking. The real question to be determined is, Can we afford not to improve our highways? The marketing of farm products, the exchange of commodities, the social and educational advantages, and many of the enterprises and industries depend, to a considerable degree, for success, upon the favorable condition of the highways.

Few people have any very definite knowledge of the actual cost of transportation by wagon and horses, or how much it costs to get the surplus products of the country to market, or what it costs to effect the exchanges necessary in business or transportation for pleasure.

Statisticians have made some effort to determine and fix a scale of the probable cost in the transportation of products. It is estimated that the average cost of transporting one hundred bushels of grain one mile is sixty cents, that is, taking into account the different distances that farmers have to draw their wheat to market, the condition of the highways, teams, etc. It costs the farmer more to draw two bushels of wheat one mile (at the average rate of sixty cents per 100 bushels), than it costs a railroad to haul one ton a mile, or it costs a farmer twenty times as much per mile to draw his wheat to the railway station, as it costs the railroad per mile to haul it to market.

When we take into consideration that the wheat crop of the past season aggregated probably 450,000,000 bushels and that the average distance required to be

*This paper was read to a number of Farmers' Institutes in Indiana and is published by request.

traveled by the teams to draw the crop to the railway stations is six miles, the cost of getting the wheat to the railroad would be over \$16,000,000. Then add two billion bushels of other grains, also fruits, vegetables, and products not named, that have to be transported to market. The whole probably amounts to \$100,000,000 per annum. If these estimates are approximately correct, the need of good roads, and the gain to be had from building them is manifest.

The cost of getting products to market over good roads, compared with bad roads is less by one half; the loads drawn over good roads may be almost doubled, and the power required to draw them less. The time is shortened and the wear and tear upon the vehicles and teams is much less.

Good dirt roads all the year would reduce the cost of transportation quite one half. With good roads all the year, the farmer could select his own time to market his products—selecting a time less pressing with farm work—he can, if he wishes, draw his grain to market in the winter, but with the present bad condition of our highways it would be impossible, unless they are bridged over with a freeze and when frozen they are generally so rough as to wear heavily upon the wagon and team. In many sections of the country the roads are hardly passable for two or three months in the winter.

There are losses resulting from bad roads that we seldom consider. We mention the loss occasioned by not being able to market products when prices are best, for the reason that the condition of the roads will not admit of it. Another loss arises from our inability to market some products that have no considerable value, for the reason that the cost of transportation over the bad roads will not justify the undertaking.

The advantage of rapid transit is worthy of consideration. To be able to turn out with a good team, with lines in hand, and make six or eight miles an hour is a pleasure, is exhilarating, is much to be desired. But the present condition of most of our highways will tax to the utmost our physical strength to endure the jolting or the slow plodding through the mud, and exhausts the strength of the team. Indeed, we so much dread the punishment of travel under such circumstances that we will not go unless necessity compels us.

The isolation of country life will be a thing of the past if we make our public highways good all the year. The good people can then go to social gatherings, meetings, lectures, or concerts in country, town or city, if they do live five or ten miles in the country. A few miles in the country will be no bar to the educational advantages, so much desired for our families. As it is, farmers living three or four miles from town are moving in to educate their sons and daughters, and they justly assign as a reason why they do so, that the roads are so bad much of the time that they cannot travel them with comfort.

"The boys are leaving the farm" largely for the reason that there are no social advantages in the country. The want of social and educational advantages breeds discontent.

With good roads a drive of four or five miles would be enjoyed, and would be healthful in connection with school hours or social meetings.

With good roads, it would often be, that distances of five, ten or fifteen miles along the lines of railways would be traveled by private conveyances, rather than wait the time for trains and the inconvenience incident to railway travel.

With good roads light steppers will carry us about as fast as we may ordinar-

ily wish to go. A farmer living ten miles from the railway station having a good road to travel is as near the station for all practical purposes, as the farmer that lives within four or five miles, the latter having a bad road to travel.

Good roads are beneficial to railroads, by distributing the business regularly through the year, enabling them to do their hauling without extra expense and at a less cost. If the highways are locked up one fourth of the year, and freights light, then extra expense will be incurred when the roads get good, to furnish rolling stock and extra help to take care of the business. Common roads are feeders to railroads, good or bad, depending upon their condition.

Towns and cities are directly interested in this subject. If a town or city commands a trade from a given territory having bad roads, the territory may be correspondingly enlarged by making the roads good. With good highways products will be hauled greater distances.

Improved highways in all directions would increase the rivalry between towns and the market price of products which farmers have to sell, and lessen the price of supplies which farmers have to buy. Sharp competition will enhance the values of products which farmers have to sell and add to the business activity.

Good roads will greatly influence the methods of farming for the better. A farmer living five miles from a railroad station, with a good road leading thereto, and within less than a hundred miles of a large city, where there is a good market, and having a farm that is well adapted to butter or milk dairying, will, if he is a shrewd business man, turn his attention to this branch of farming, or some other branch that will meet the demands of the city market. In determining the most profitable branch of farming to engage in, he will never leave out the

question of the condition of the highways. The permanent improvement of the highways throughout the State will make a great change in the agriculture of the State. Very many will quit *extensive* farming and become *intensive* farmers. We greatly need more of the intensive to develop the material resources of this grand commonwealth.

With all the advantages incident to good roads, there would be an increased value of real and personal property. Lands that have a market value of \$40 per acre to-day would then have a value of \$50 or \$60 per acre—probably more. Suppose that the average increase from uniformly good roads throughout the State is \$5 per acre, there would be added to the wealth of the State \$116,315,000. Then, add to this immense sum \$6,000,000 saved in the transportation of our products to market, and we would have an increase of wealth aggregating over \$120,000,000.

But, leaving the increase of wealth out, the better business and social advantages will justify the cost of improvement.

Do you know of any way we can add so much to the wealth and business prosperity of the State, as by improving the highways? Besides, do you know of any increase of wealth that will entail as many advantages as this, in every way?

But "it will cost so much," say some. So it will, but the saving in cost of transportation of our market products will do the work in a few years, with intelligent, faithful supervision.

SUGGESTIONS ABOUT ROADMAKING.

The writer is not here to speak disparagingly of the supervision of those who have in the past had the work in charge. Much of the work has been done by men of practical sense—men who did the best they could with the means they had in hand. Those who performed the labor were their neighbors, who were

alike interested, and over whom it was not expedient to exercise lordship, but whose advice, as a whole, it was better to heed and thus promote the harmony of the neighborhood.

The road districts are usually large, and the amount of work needed to be done was more than the days of labor and tax assessed would accomplish. Under these circumstances, it was thought best to compass as much as possible with temporary work.

THE QUESTION OF MOST IMPORTANCE, IF NOT "THE" QUESTION, IS,

How is the money or labor, or money and labor, to be had, and be just to all concerned? This question has been studied and different conclusions arrived at, for many years past.

Neither do we propose to solve this question in this paper, but, rather, to briefly review the methods proposed.

As an introduction to this question, we will state that it is generally conceded that the roads of a country are a general benefit, and if a general benefit, they should, in some sense, be a general charge.

We have had a law in this State, and have now, providing for laying out and constructing gravel or turnpike road and assessing the benefits upon the lands contiguous to the roads. But, does such an assessment reach all that are benefited? Certainly, beyond a limit of two miles farms would be benefited, and even the towns and cities to which the roads lead would be benefited. It would seem then that a more general tax would be nearer even handed justice.

A poll tax is used for raising the revenue in some States, but this system is certainly unjust, if the benefits accruing are in any sense to govern the distribution of the burden.

Our State requires the supervisor to warn out all the able bodied men, between the ages of 21 and 50 years, to

work the roads two or four days in the months of April, May and June, and upon their failure to comply, he is required to bring suit for the value of the labor within ten days, if there is any prospect of being able to collect it.

But, is it even handed justice that John Smith, who is not a land owner, and does not own a team, not even a horse, but who has a family to support with his daily labor, should perform the same service that John Jones does who runs two saw log teams?

It does seem that justice demands that the burden should be borne in proportion to the benefits realized. But to equalize the burden somewhat, the township trustees with the concurrence of the county commissioners shall levy a road tax, not to exceed 30 cents on the 100 dollars on real and personal property of the township outside of the towns and cities. But, why make an exception of towns dependent upon the trade of the country adjoining thereto? They are benefited quite as much as the country.

The tax, however, may be worked out, by the parties assessed from July to October, and if not the amount shall be paid into the county treasury with the spring taxes.

The writer has had some experience as to the working of this system, which is about as follows: Farmer A has a few dollars tax to work out, and throws a few slats on his wagon, and drives to the nearest sand bar or gravel pit and hauls a few loads of gravel or sand and dumps them where he thinks they will do him the most good. Though dumped out as they are in piles, they become obstructions to the road for some time at least. Farmer B has a few dollars to work out, and he takes his team and performs about a like service where he thinks it will benefit him, and the same is true of others.

So it follows, that the work done is of little value, without any system and with little regard of the public good. They get their certificates, certifying that as good citizens they have performed the labor required to the amount of dollars and cents assessed against them, and hand them in when they pay their taxes as so much honest money.

Much of this work is done in the month of September, a time of the year when the work will not become smooth for travel, and is likely to be worn into deep ruts by the fall and winter travel.

There is a sad want of spirit in our local affairs, we are content to let these things drift, we are altogether to conservative. A little more State and local pride would be commendable, would make better roads.

Formerly supervisors were elected for one year, and the responsibility was lightly borne and soon over. Now the law provides for four years, which is better.

We do most respectfully suggest that it would be better to systematize our road improvement, and have the work supervised by competent men.

THE CLASSIFICATION OF ROADS.

First, would it not be better to classify the roads as first, second and third class, and apportion the money and labor for their maintenance only.

A road leading directly from one important point to another and much traveled and important as a highway, over which the surplus products are to be hauled to market, let such a road be known as a road of the first class and improved with a view of making it equal to the demands.

A road accommodating a large neighborhood or connecting two or more important points, frequently traveled, but having no very heavy travel, be known as a road of the second class.

A road accommodating a few only, and leading out into some other road, be known as a road of the third class.

Then make the road districts large enough to employ a competent man the greater part of the year to supervise their improvement and maintenance.

The road supervisor should be competent to lay out, determine the grade and kind of improvements needed. He should have a practical knowledge of his business. The road supervisor should purchase all needed road machinery and employ the labor necessary to improve and keep the road in repair. And a township tax should be assessed and collected sufficient to defray the expense. With such provisions, the work of improving the roads could be done in the months when the labor expended would give an adequate return.

With the improved machinery now in use, two or three men with two teams can do as much work in the grading, leveling and compacting of a road, as fifty men can do under our present system of road working, as generally performed, the State over.

ROAD CONSTRUCTION.

About road construction, we suggest that the roads of the first class should be graded down to a slight incline where there are rises and hills. The greatest allowable grades should be determined, and worked to. Slopes have their advantages in the ready discharge of surface water, but the inclinations have much to do with the size of the loads hauled over them.

One foot rise in 115 feet is considered the least fall necessary to secure surface drainage.

With a rise of one foot in 44 feet a horse can only draw three-fourths of a load that he could draw on a level.

On a rise of one foot in 24 feet, he can only draw half as much.

On a rise of one foot in ten feet, or 528 feet to the mile, he can only draw one-fourth as much.

We know by experience that in loading our teams for market, we are governed by the hardest pulls, which occur where there are steep hills or the worst mud holes. If there is a steep hill to climb we may conclude that 35 bushels of wheat is enough, but if the hill was graded down to the inclination of a first-class road, the team could draw 60 or 70 bushels.

Does it not occur to you, that such obstructions in our highways are expensive in a run of years? Much more expensive than the cost of their improvement.

The surface of the road should be smooth when completed. Yet we find it frequently the case, when grading has been done on a road, with common scrapers, that the surface is left so uneven as to make it necessary to place rails, poles and other obstructions, in the side ditches to compel the travel to the center of the road, and then it is hardly possible for the driver to keep his seat. Do we not know that such work never levels down with travel, but to the contrary, the surface works into chuck-holes. Roads when graded, should be leveled down smooth on the surface, and rolled until compact.

Every person who travels to any extent, knows this statement to be true from observation, and yet we go on working the roads in the same hap-hazard way. It is for the want of systematic supervision.

THE ROAD BED.

In grading, the road bed should be made slightly crowning to the centre, so that the water of rainfall can flow off readily.

THE WIDTH OF ROAD BED.

The width should depend on its class.

If first class, having a heavy travel, it should be in some instances 24 feet, from 16 to 24 feet as a rule.

Roads of the second class, 15 to 18 feet.

Roads of the third class may be only a single track, with sloping sides to allow teams to pass.

The width should not be more than the travel requires, for every added foot more than the travel needs, kept in repair, is so much money and labor wasted, as may be required to do the extra work.

Do not make the crown of the road too high, for the reason that where the center of the road is too high, the wheels of the vehicles have a sliding tendency, which wears the roadway and wears the vehicles as well. The latter, especially where the roads are made of stone or gravel, and the labor of the horses is increased.

DRY ROAD BEDS.

A dry road bed is imperative in the construction of good roads. The foundation upon which we build should be dry. In our alluvial soils it will often be found expedient to lay two lines of tile drains at a depth of three feet or more, depending upon the outlet that can be had, a line to be put in on each side of the road bed, on the inside of the open ditch, to keep the storm or other water from soaking under the road bed. By so doing, the foundation for a good road will be permanently provided for. If well done, this part of the work will never need repair, will be permanent and make a good dirt road most of the year, if the grade is kept smooth by occasionally running the scraper over it.

In many sections of Illinois it is the only improvement they make on their highways, and they claim that such highways are good all the year, excepting a little surface mud of an inch or two in depth, a day or two after a long

continued rainfall or freeze. A good load may be hauled over them any season of the year.

By underdraining the road bed sufficiently to make it dry and solid, and grading so as to prevent the accumulation of water on the surface, and repair the wear incident to travel, our common roads may be made passably good, at all times.

But the road will be still better if coated with good gravel. By underdraining the road bed, there will be a saving of one-half of the gravel that would be otherwise required to make a good road. The necessary bridges and culverts, are, of course, included.

THE USE OF BRICK.

Sometime in the near future, we shall in all probability have cheapened the production of brick, so as to use them in the improvement of our highways.

Leaving the matter of future speculation aside, we are confronted with the fact that we are not making the best use of our time, labor and money, in the improvement of our public highways. We can drain and grade and gravel, and in this way put them in good condition for the greater part of the year, provided we get at it with some general and well defined system.

We hardly appreciate the importance of this question until we look at it from different standpoints. The writer is quite well aware that he has not exhausted the subject, indeed it has been a question of serious import to make a choice of much that might be said.

We conclude that if the highways of any good agriculture State, such as our own, were well improved, graded, drained, and having substantial bridges, culverts, etc., that the value of our lands would be increased from five to fifteen dollars per acre. On account of the better market facilities, the increased business en-

terprise, and the social and intellectual advancement, that would result from work well done along this line, and the cost of such an increase of wealth would be more than covered by the saving in the cost of getting our surplus products to the nearest railway station or to a home market.

Again, the question rises before us, Can we afford not to better improve our highways?

Agricultural.

The Tramp's Christmas Story, Or Why I Left The Farm.

BY W. A. PAXTON, GREENE COUNTY, O.

Oh, yes, I'd once as pious appearin' old dad
As any teller ever had.
We had as nice a farm as you'd wish to see,
And stocked up full as it could be
With horses, cows, and sheep and hogs;
Why, they were as thick as a dead'nin' is o' logs.
An, me? Why I was happy as could be
I'd git up o' mornin's afore 'twas light,
And work all day till after night,
And go to bed and think, and think—
Sometimes so tired I couldn't sleep a wink
'Till nearly day, 'n I'd hear the old man say
"Come, Jim, git out o' that.
You're gittin' as lazy 's an old house-cat;
Git out 'n fed that spotted pig
If you ever 'spect him to grow up big.
Then up I'd git, and out I'd go,
Sometimes in mud, or slush or snow,
And help to feed and tend to things,
'Till a long while after the school-bell rings,
And then I'd run all the way to school,
To keep from bein' a "tarnal fool,"
And git in late, as the readin' class
Was just a goin' to their seats to "pass."
'Twas that a way most every day;
I never had no time to play;
I never had no balls and toys
Like lots 'o other people's boys,
But I had to work—just like a Turk"—
Year in, year out—year after year;
But I knowed no better, 'n didn't keer.
I'd a been there yet for all 'o that,
And not been roven' like a homeless cat
If I'd only been half treated right.
It wasn't working from morn till night
That drove me out. No, never, no.
I didn't mind the slush and snow,
And never refused to get up and go,
Whenever the old man told me to.
I liked to do it; I'd ruther stay

Out in the barn in the chaff 'nd hay
 And watch the horses munch the corn,
 And tend to the lambs when they first was born,
 And feed the calves and colts and pigs,
 Than to ride to-day in your finest rigs,
 The stock all knowed me, and liked me, too;
 I know they did, or they wouldn't do
 And act the way they used to do;
 For stock haint like deceitful men—
 Let on like they like you for awhile, and then
 Turn round and let you plainly see
 That they're tired o' your society—
 That they really didn't like you at all,
 Why the calves 'd run and hawl and bawl,
 And the sheep 'd bleat, and the pigs 'd squeal
 Arter me when I went in the field
 'N the colts 'd come a prancin' 'round,
 And old Shep. would come with a happy bound,
 Whenever they'd see me. And I just know
 That they done that way 'cause they liked me so.
 But you want to know
 Why I left such a home to rove and go
 Out in the world so cold and wide,
 To stem along the stormy tide?
 Well, I'll just tell you how it come
 That I left what you call a "pleasant home."
 And first, you know, I told you how
 I had to work from early light
 All day, and often after night?
 Well, that's all right;
 But I haven't told you yet
 The kind of pay I used to get.
 My father used to say his prayers
 And ask forgiveness from his cares;
 But all the time he'd pile 'em higher,
 Like puttin' on wood to put out fire.
 To keep me interested tendin' the stock
 He'd give me enough for a right smart flock;
 I'd tend 'em and love 'em, and they would grow
 Till they'd get great big, then they'd have to go.
 All the runty pigs belonged to Jim,
 But when they were hogs they belonged to him.
 He was always a givin' me colts and calves
 To raise and feed on the sheers or halves;
 But some how or other, whenever they'd grow
 And get big or fat, they'd have to go.
 And when they were sold, they "belonged to him."
 Some how or other they grewed away from Jim.
 I never was lucky, somehow, that way;
 But I didn't say nothin'. One Christmas day—
 We hardly ever paid any 'tention
 To Christmas time, for if we'd mention
 The thing to him, he'd gen'rally say
 "I don't take no stock in Christmas day—
 But one Christmas day, says he to me,
 "You've heen a good hoy, Jim, good as kin he;
 There's that speckled calf—do you see him?
 Well he's a Christmas gift for you, Jim.
 He's not been doin' well this fall;
 He's got so he won't come when I call—
 But you may have him for a Christmas gift;
 Go fetch him in 'fore he goes on the lift."
 Well I took that calf and I brought him in;
 Though he was little hut hones and skin.

I shelled him corn, and warmed him milk,
 And hy spring I had him as fine as silk.
 I turned him out in the spring to grass,
 And he'd always come when he'd see me pass.
 I rubbed him and loved him, and he loved me:
 Why the way he showed it anybody could see
 He'd do anything I'd tell him to;
 He'd gee and haw—anything a calf could do.
 And he grew—well you never saw the beat;
 Why he got to fat to stand on his feet,
 Of course he was mine—they all knew that;
 Mother said that was why he got so fat.
 The neighbors knew it, and asked me—"Jim
 What are you going to do with him?
 I didn't know, I loved him so;
 I thought it 'd kill me to see him go
 To be killed for heef. But I didn't say
 A word about it. At last one day
 When I had been workin' a sawin' logs,
 And shuckin' corn for the fattnin' hogs,
 When I come home and went to see
 My big fat steer, where could he be?
 His stall was empty, dear, oh dear!
 What has become of my big fat steer?
 Says father a smilin'—I can see him yet;
 That smile 'o his'n I can never forget:
 "Well Jimmie if it 'll be any relief,
 An' put a stop to your foolish grief,
 I sold him to-day for a Christmas heef.
 Ha! ha! You know he was a Christmas gift,
 And I tell you he gave me a right smart lift
 On that piece 'o land just over the way
 That you know I bought last Christmas day.
 I've spent the money I got for him,
 But I'll give you a calf in the morning, Jim."
 That was all he said. I went to bed,
 But not to sleep, for through my head
 Ran thoughts of how he had treated me,
 And nothing better before could I see.
 I rolled and tumbled the most of the night,
 Got up and left before it was light.
 My heart was broke, which is worse than your arm
 And that is the reason I left the farm.

WONDERFUL IF TRUE.

At a recent meeting of the Wisconsin
 State Board of Agriculture, in the course
 of the discussion President Chamberlain
 said:

"It has now been discovered that micro-
 robes play a great part in making soil
 fertile. Experiments have been made
 that show that these little animals take
 in free nitrogen from the air and make
 it available for plants. Here is a new
 and wonderful science. We have been
 told of the wonderful works of animals

and plants; we have been told that trees feed their oxygen to animals and that animals feed carbon to trees; but how the nitrogen is supplied to both was a mystery. Now it is known, and it will not be strange if we begin to sow our fields with microbes. This feeding will soon become a scientific art."

More directly to the point Prof. Henry spoke as follows:

"It has now been discovered that the clover plant has a minute insect associated with it that takes the nitrogen from the earth and air where it exists in a free state and transforms it into nitrogen and supplies it to the plants. It is the most wonderful discovery of the age. These little animals live in the knots that you have noticed on the roots of the clover plants. There has been a question connected with the latter that has puzzled the scientists for twenty years. What were those little knots doing on the clover plant? Were they a part of the root that formed some part of the nutritive system, or were they the home of some minute insect that was preying on the life of the plant? Scientific investigators had made what they supposed were faultless experiments to show that no plant could take nitrogen from the air, and that its only source of nitrogen from which the plant could draw was from the water and soil. This has been supposedly proven by elaborate experiments, in which the plants were kept under glass, and all the air that was given to the plants was analyzed both before and after its use by them. But a short time ago Prof. W. O. Atwater, at Washington, made an experiment that seemed to completely overthrow all other theories and experiments. He took some seed and analyzed them, to be sure of the amount of nitrogen in the seeds, and then analyze the soil and all the water that was given to them in the

course of their growth. Then after the plant was matured he analyzed all, and to his surprise found that in the soil alone there was more nitrogen than there had been at first in seed, water and soil. How did that nitrogen get there? was the unanswerable question. He was not able to make the discovery of the true answer and left the question there. Other scientists ridiculed his experiment and said it was impossible to get any such results if he had conducted his experiments correctly; but Prof. Atwater stuck to his declaration, though he could not explain the reasons for the results obtained. Now at last a German has made the discovery that has long eluded us, and we can now snap our fingers at the nitrogen trust in New York, for we need no longer pay sixteen cents per pound for our nitrate of soda, but will produce it ourselves at little expense. We should build a monument to that German, in spite of his long name. He tried experiments on clover, first analyzing the soil and cleansing it from all insect life. Then he supplied nitrogen in various forms, but in spite of all his efforts the clover plant did not flourish. After a while he brought some soil from a clover field and put it around his plants. In a short time little knots began to form on the roots and his plants took a new lease of life. The fact was he had inoculated that soil with those minute insects, and they at once multiplied in great numbers and went to work to feed nitrogen to these plants. Now, said that investigator, those little knots contain the secret of the clover and the nitrogen, and an investigation showed a minute germ, call it bacteria if you will, whose whole work is to produce the nitrogen that the plant needs. Thus the plant is provided with the necessary element and the ground is left richer than it was before."

FARM ECONOMIES.

An Ohio Farmer States Some Plain Methods in Few Words.

It is a fact peculiarly suggestive that never before in the history of our country have the laboring classes been more thoroughly alive in their interests than they are at the present time. They are beginning to study questions heretofore considered too intricate for common intellects. They study too with a determination not to form hasty conclusions, but with a definite purpose of informing themselves in such a manner that in the future they may better understand their rights and privileges as well as their duty in the community at large. While it is well that we seek to bring about national reforms that may equalize the burdens of taxation while more widely disseminating the benefits of legislation, it is equally important that we do not lose sight of opportunities to improve our conditions by domestic reforms which, though less exciting and more easily obtained, are nevertheless of vast importance to our financial success as well as to our domestic tranquility.

There is a wider field for reform in farm management that many are willing to believe, and while we would not discourage any one in the study of political economy or affairs of national importance, we would urge upon all a more strict attention to little sources of profit and loss in the administration of our home affairs. Were we scrupulously mindful of all the leaks and losses about the farm we would, in all probability, have less occasion to find fault with the administration of governmental affairs.

It is because we are extravagant and wasteful as a people that our officials dare to be extravagant in their official capacity.

No one conversant with the facts doubts the necessity for governmental reform; but in spite of the inequalities of legislation it is possible, by proper management, to stem the tide, pay off debts, improve one's home, cultivate the intellect and have odd times for useful recreation.

Six years ago we purchased a farm of eighty-two acres in Northwest Central Ohio. We started in paying interest on twenty-three hundred dollars of the purchase money, besides going in debt for part of our stock and farming implements. Considerable ditching has been done, the barn enlarged and remodeled, several outbuildings erected, and last year a large and convenient ten-room dwelling, with modern improvements, but to day we are ready to square accounts and have a small balance left. In some future letters we may tell something about our methods of farm management—*Leo De Witt of Bellefontaine, Ohio, in 1rairie Farmer.*

TO THE POINT.

A good deal of the discontent of this world is made by false, and demagogue teachers, trying to persuade third-rate men, that they ought to be in first-class places; and that without their making an iota of advance in their capacity to fill such first-class places. This truth applies to dairy matters, as well as to everything else; and the cruelty involved in creating discontent in many a dairy farmer's mind, comes in when he is told, as he is often told by his wise or unwise advisers, that he can make just as good butter, as the creameries can,—or any body else can, and that he ought to have as much money per pound for it, and he is robbed if he don't get it! As a rule, he can't make butter; and if he could, then as a member of a class, he cannot sell it in sharp competitions

with farmers and factories who are ahead of him in knowing how. He has got to learn a far more difficult knowledge to acquire, than how to breed, feed and milk cows to the best advantage, before he is a first-class man in the commercial arena. He can be a bigger man, every way, by being a pronounced success on a few lines, well understood, and enlarged as he gets the capital and experience, than he can be to spread himself out thin, and be a comparative failure, all round.—*Hoards Dairyman.*

Correspondence.

Review of D. W. Stookey.

Editor Drainage Journal:

This squib would not have been penned had I not read the valuable contribution of D. W. Stookey to the March number of the JOURNAL, entitled "Drainage and Plant Food." The writer has no criticism to make upon the article. It is modest, chaste and pointed. Mr. Stookey will please permit me the use of a sentence or two as a basis for the following remarks.

Mr. Stookey, in his second sentence, says: "Tile drainage assists the chemical preparation of plant food in the soil in various ways." Permit me to ask, is plant food prepared in the soil? Experience answers, no. Two hundred pounds of soil, when thoroughly dried, were put in a tight box, the soil dampened and in it planted a sprig of willow. When the time arrived to complete the test the box was taken to pieces, the roots of the willow brushed, and every particle of experiment soil saved, dried and weighed. The willow, roots, body and branches all weighed 169 pounds. The residue of soil weighed 199 pounds, 14 ounces. So it appears the soil contributed two ounces to the growth of

the willow—1 part in 1352 parts. Yet we all admit that manures and fertilizers must be added to exhausted soils, if their cultivation is made to pay. These manures and fertilizers, however, are solids, and the experiment shows that the willow appropriated the solids of the soil in its growth in infinitesimal degree. This sap that mounts up the capillary pores of the tree in spring is not the true sap (or cambium) that affects its growth. This first mentioned sap, good Samaritan like, regarding not gravitation's law, wends its way up to the plant's utmost blossoming, and there in the leaf, the great laboratory, it completes its journey, fulfills its mission and is then released from further duty. The leaf is the lung of the plant. In it, or by it, those changes are wrought upon the gases, fluids and solids obtained from the air and soil that prepare them for plant assimilation. The leaf absorbs carbonic acid gas from the air, decomposes it, exhales the oxygen and appropriates the carbon.

The work done by the leaf, the lung of the plant, is in part opposite to the work done by the lung of the animal. The leaf inhales carbonic acid gas from the air, decomposes it, exhales the oxygen and appropriates the carbon. The animal lung inhales air, in part decarbonizes the mixed chyle and venous blood, and exhales carbonic acid gas and nitrogen. So that plants in dwelling houses manufacture that needed by the indwellers, and the indwellers that needed by the plant. Each promotes the other's weal. Who understands all this? I do not. There a kernel of wheat falls upon the ground and is covered by soil. Through the aid of air, warmth and moisture, saccharine fermentation is set up, and the starch, gluten and albumen of the wheat kernel is converted into sugar, which the em-

bryo plant, dormant till now, feeds upon and grows apace. It sends down root-lets into the soil, pushes a bundle of blades into air. Was this germ here created, or was it implanted in it by the parent stem? If so, will it in turn provide a germ for its offspring? Some teach that each seed contains the germs of all succeeding seeds in the use of the following:

Lo, the acorn, in its bulb compressed,
Cradles a second nestling on its breast,
In whose fine arms a young embryo lies,
Folds its thin leaves and shuts its florid eyes.
Thus maze within maze successive harvests dwell,
And boundless forests slumber in a shell.

We are taught that the material for the growth of the vast forests that clothe the earth was obtained from the air, yet if you deprive a tree of its moist hold upon the soil, it dies. J. ARNETT.

Arnett's Theory Examined.

Editor Drainage Journal:

In your issue of April I notice quite a dissertation on the New Madrid earthquake of 1811, by Mr. J. Arnett, of London, Ohio. Evidently Mr. A. has never visited that section, and has not even carefully studied the maps (U. S. Topographical survey, 1879,) of the Mississippi River from Cairo to the Gulf.

I have been living at New Madrid, Mo., for over fifteen years, and engaged as civil engineer on railroad and river surveys and in charge of a large land drainage scheme for three years.

So far as I have been able to observe there is no reason to believe that any portion of the earth's surface was either raised or lowered by the earthquake. The most reliable and reasonable descriptions give it as a series of shocks visibly evidenced in a wave motion of the earth, so severe as to break the surface in places, for distances of 10 feet to 200 feet, and by the force of the concussion throwing out large quantities of sand and water,

(the entire valley being underlaid with sand,) leaving ridges of sand on either side of the earthquake crevice. I have not been able to discover any of these crevices over 200 feet long and 4 feet wide.

It is not certainly known that any persons were killed nor any houses thrown down.

It is certainly known that the channel of the Mississippi River was not disturbed or changed at any point. All the lakes and bayous of that section anti-date the earthquake and there is only one feature of the topography possibly traceable to the earthquake as a cause. Some of the small bayous or creeks were obstructed by the shaking down of the leaning trees on their banks, causing a clogging of the already sluggish stream and a consequent overflow producing swamps of considerable extent. Some of these are now being reclaimed by dredging out the old channels, notably in New Madrid County.

Mr. A.'s theory of the raising of a river's banks by its overflows is more applicable to smaller streams than the Mississippi, and is true of the bayous of this section. The valley of the Mississippi at Cairo and below is filled with a deep sub-strata of sand 100 feet to 300 feet deep, evidently placed there before the Mississippi ran through it *as a river* and while it was yet an arm of the Gulf of Mexico.

From Cairo to Memphis the river follows the eastern edge of the valley which is 15 feet to 30 feet higher than the western edge, which is drained by the St. Francois, and the topographical evidence is absolute that it never has had its channel in the western half of the valley.

The engineering now being done on the great river is with the purpose of improving the navigation, while the true

policy should be *drainage* and the day is not far distant when the vast alluvial bottoms, now subject to occasional disastrous overflow will be demanded for agriculture. The Mississippi valley is destined to be greater than the Valley of the Nile in this regard.

OTTO KOCHTITZKY.

Mt. Airy, N. C.

Reply to Delfer.

Editor Drainage Journal:

In the P. S. of the contribution of Mr. F. L. Delfer to the JOURNAL of May, 1891, he says, with regard to his teaching in his paper of August, 1890, prefaced by *in books on drainage, pamphlets, etc.*: "I fail to see how anybody could understand me different." Mr. Delfer was quite modest in putting forward his own ideas. But if he had faith in his own teaching, why quote anyone else? If he does not espouse the doctrine taught by Prof. Duenkelberg and Major Glynn, why quote them? For they are the axioms, caroleries, scholiums, etc., adduced to make clear the proof of the proposition. The undersigned may not be possessed of the medium portion of common sense required, but he fails to learn what Mr. Delfer's standard of measure of his experience and ideas about outlets, fall in ditches, etc., is, unless it is a medium of common sense and to have uninterruptedly laid tile since 1870 as he has.

The teaching of Prof. Duenkelberg, is, mainly, in error. Suppose the drain does run full at outlet—what then? The surface and subsoil water being heavier than air, will first enter the drain and pass off, and when this process frees the surface and subsoil of superabundant moisture the air will enter following the receding water to fill the pores in the soil left by it.

A tile drain, unless very short, can only run full when the outlet is sub-

merged. In any other case the flow of water becomes attenuated by accelerated velocity, and in a long drain will not run more than two-thirds full at outlet.

It is no use to cite Prof. Duenkelberg and Major Glynn as authorities unless their teaching accords with the experience of to-day. The ancient philosophers taught that there were but four elements in nature—earth, air, fire and water. Philosophers of to-day think differently. Come again, Mr. Delfer. I am not going to be disposed of so summarily by your conclusion. Remember, however, if you expose your flank, and I have the needed common sense, I will, Gen. Grant like, make a flank movement. J. ARNETT.

London, Madison Co., O.

Utilize Wind and Water.

Editor Drainage Journal:

During the recent drouth just broken (May 21st), after four weeks of dry weather, we have felt the need of some system of irrigation for our fruit and vegetable garden.

A well 35 feet deep, with windmill and tank, with 100 feet of hose, and a little attention, would have done the work. At this writing we might have had (with the facilities named) an abundance of garden vegetables and strawberries, almost ready to pick. As it is, our garden has been on the stand-still for two weeks; the early strawberries have dwarfed and hardened until they can give us no return for care and labor bestowed, and the later berries are injured. There are the radishes, lettuce, peas and other vegetables green, it is true, but away behind what they might have been if we had had the facilities for watering them.

We can have these provisions named, and we will—a good windmill, tank and hose. While we are at it we shall lay a few lines of tile 12 or 15 inches below

the surface, and about 10 feet apart, connecting them so as to make a system of under irrigation. The losses from dry weather this spring would have paid for such improvements. ADAM WELLER.

Indiana.

Where is the Trouble?

Editor Drainage Journal:

I have laid a line of tile through a swale, which is on quite a rise of ground. The tile drain is 30 inches deep, or about that, and a lateral that empties into the main drain is only eighteen inches deep in the swale. Along the main drain and the lateral in the swale the water is standing on the surface over the tile, and has been for weeks. Will it do any good to dig down to the drain and set tile on end so as to give air to the drain?

D. G. B.

[No sir; no good, whatever. The trouble is in the work already done. Your drain has not been properly laid. The drain is not open, or it is higher at some point beyond the swale than it is in the swale. A drain should have a regular fall from the head to the outlet; if it has a regular fall and is open all the way, the water will run out as certainly as water will run down hill. There is no need of letting air down to the drains or attempting to, for the water will fill the tile set on, and until on a level with water in the soil or on the surface. The water will flow away if the drain has the fall and outlet necessary to make it an efficient drain.

We predict that if you will take up the drain and test the bottom with a level, that you will find at some point outside of the swale that the bottom of the drain is as high as the water in the swale, or, if this is not the trouble, then the drain has been stopped up at some point. As the water runs out the air pressure will force the air down into

the soil, filling every space in the soil, relieved of its water of saturation as rapidly as the water passes out.—ED.]

Fertility Wasted.

Editor Drainage Journal:

When I see the water running away in little rivulets, discolored with the manures and finer soils of the surface, I say somebody is paying dearly for his want of information or observation, and it may be his laziness.

When I see a man piling his manure in the field in the fall of the year to leach and run away every rainfall over land that is not underdrained, passing into the streams near by, to be lost to the fertility of his farm for all time to come, we say that he is paying dearly for his want of observation.

When I see gently undulating land washing into little gully and the muddy water rushing down and off, bearing the soil's best treasure, I say the time is near at hand when the high places on that land will yield but little return for labor expended upon them in the cultivation of crops.

How easy it would be to run a few underdrains up these slopes, with lateral arms to take up the water, literally drink up the water that falls on the slopes, running out from the mouth of the drains clear and pure, leaving its fatness behind to enrich the soil.

We say to farmer Adam, "Don't you think it would save the soil of your rolling land to underdrain it?" and he says, "I don't know—there's plenty o' land," and he goes right on in the same old groove, his fields getting poorer, and the want of fertility, washed away in all these years, unseen by him, only adds, if possible, to his list of complaints, and want of legislation to make him rich.

Wasted fertility from washing and leaching year after year, which might have been prevented by underdrainage, tells the story of his woes—to him that reads as he runs. PETER SIMPLE.

Tilemaking.



THE BURNER.

In the manufacture of drain tile or any product made from clay the last and important point is the burning or baking. The value of the labor of digging, drawing, tempering, pressing, drying, handling to kiln and setting, depends upon the success of the burn. A failure at this point is a loss of labor all along the line. No manufacturer of tile can afford to have the burning neglected. If the burner is a time burner, one who adds to his fires a given amount of fuel every 30 minutes, more or less, and then rests between times, the probability is, that the best time that he can have given him is his time at the office and his pay and discharge. Or, if he is set in his notions, does not get good burns, and yet is unwilling to make any change to improve the burn, or try to better it in any way, it is better to let him go up to the "Captain's Office."

The successful burner is a constant watcher; if the fires need fuel or poking, or any mending, he is on hand to attend to it. There is no whittlings scattered around where he sits, waiting for time,

because he is not a "sitting burner." No burner can have uniform success and follow a time rule. There are so many other things that have to do with the success of the burn that he must be on the alert. The weather, the air, the wind, the draft, the fuel, the many other things, demand constant attention and good judgment, to get the best results. The best kilns in use will not turn out good ware every burn unless the burner understands the kiln and the importance of watching all the points likely to effect the result.

Once upon a time we knew a man who was operating a small factory who did his own burning. In watersmoking he was alert—did it well; when he raised the heat in the kiln he commenced firing up himself with a drink, and as the heat in the kiln was increasing, he fired up inside himself, until he concluded the kiln was burned, by which time he was "biling drunk." It took about as long to cool off himself as it did to cool the kiln. It is unnecessary to remark that he was not a success as a tile manufacturer. The sheriff took charge of the works after a few short years. If there is a time when a burner needs to be sober and have possession of all his faculties, it is when he is burning a kiln—so much depends upon it.

It is often the case that new men, who are watchful and attentive, and have good horse-sense, succeed better than those burners who claim to be professionals. The new man at the fires watches closely and works as he watches.

A. J. Benham, Melbourne, Ia., writes: "We opened our first kiln of tile this morning (May 11th) and loaded 21 teams with tile to-day. We have put in a new 40 horse-power boiler and 2,000 feet of steam pipe for drying, and we are well pleased with it."

KILNS---THE KILN.

The kiln question is a big one. There are so many "best kilns" that those who need to change, are at a loss to decide which is the best for them to build. That there is a pressing need for a change of kiln with many tile manufacturers is easily seen in going the rounds of a few plants. The kilns are often cracked, dilapidated affairs. Some burn with open fire boxes, with or without grates, large or small openings, admitting any quantity of air, with a roaring draft or no draft, and with little or no provision to control the heat. The fuel is consumed in some instances as if thrown into the mouth of a crater, and the heat issues from cracks and fissures and chimneys, but the tile are unevenly burned; some too hard and others hardly marketable. Many of the tile are cracked, and wagon loads of bats are carted away from others.

The usual remark is: "We will try and make it do this season." The better thing to do is to build new kilns. What if it does take time and cost money, if the new kilns burn good ware? A saving in every kiln that is burned soon covers the expense. Besides, the better tile find sale that poor tile will not. A tile yard covered over with the remnants of refuse tile, the accumulation of two or three years, is a bad advertisement of the business, and stands in the way of better success.

A few days ago, we visited a summer factory that left the last kiln of tile burned in the fall unemptied, except two or three wagons had been loaded from it during the winter, taking the tile from as near the center of the kiln as it was convenient to get them. On the sides there were three or four feet of soft tile—poor tile. We estimate that half of the tile in the kiln were really

unfit for the use intended. The owner did not seem to know that anything better could be expected. He did not find fault with the kiln or the burner, but he spoke discouragingly of the want of demand, and competition. But he continues on this line.

Two miles away there is another summer factory, with no tile to speak of on the yard, neither culls or bats. The latter has two new improved kilns and has excellent burns. The neighbors say that the former cannot make good tile. Their clay is much the same quality. The tile of both factories go into the kiln in about the same condition, so far as can be seen, but the kiln, and it may be the burner in part, ends up in a failure for one and a success for the other.

We do not recommend the building of every new kiln that is offered to the business as *the best* kiln, but we do say that some good kiln should be built at some of the factories without delay, if they succeed in keeping their work out of the hands of the sheriff. But one says, "How are we to know what kind of a kiln is best for us to build? This is rather a difficult question to answer. But we would take a few days off and visit a dozen or more factories, and see how others are doing. We would keep our eyes open and drink in a little practical information, examine the clay, compare it with our own, note the kind of fuel used, and how the burning is done. A few days spent in this way will likely save hundreds of dollars in the selection and future use of the kiln of your choice.

If you are not succeeding in making good tile and the trouble is at the burning end of the business, it is time to call a halt and determine where the trouble is located. If you are using old dilapidated kilns that never did make good burns except when wind, weather, and

luck favored you, then tear them down and go about erecting better ones.

Drainage & Tile News.

Miller & Norton are enlarging their tile works at Farmington, Ohio.

The Eagle Lake (Ill.) Brick and Tile works have been incorporated.

The Boone (Ia.) Brick and Tile Works. will resume operation soon.

Bertels & Stoll, Lexington, Ill., have sold their tile works to E. M. Heafer, of Bloomington, Ill.

The Bardolph Fire Clay Works, Bardolph, Ill., have contracted to deliver 700 car loads of paving brick to Moline Ill.

The Clay Shingle Co., Montezuma, Ind., has resumed work for the season. They are receiving some orders from eastern builders.

The Cuban and Leaman Clay Co's works, Cuba, Ill., was recently sold at sheriff's sale. A new company has been organized and the works are running again.

The Pontiac tile factory opened their first kiln of tile Tuesday. We think their will be considerable call for tile as their isn't enough tile in the ground to make a desert of this country as yet, it appears.—*Ex.*

Samuel Montgomery., has perfected, as he thinks, a ditcher that will dig and level the ditch three or four feet deep and place the dirt on one side, at a cost of 10 or 12 cents. per rod, and is in need of capital to manufacture his ditchers. Any one wishing to correspond with him relative to his ditchers can address him 726 Sherman Street, Toledo, Ohio.

A special assessment of four thousand nine hundred dollars has been made for the construction of that big tile drain that is to extend from the vicinity of the Benson tile factory to the river at a point south of W. T Elliott's residence. All of the property owners interested were in favor of the drain; and as soon as they indicate their approval of the assessment, bids will be called for and the work crowded through as quickly as possible. By this improvement a large amount of low land that is now frequently inundated in a wet season will be permanently reclaimed.—*Aurora (Ill) News.*

Irrigation News Notes

At Huron, S. D.,—Arrangements have been perfected for irrigating 100,000 acres of land.—*Chicago Tribune.*

There are 10,000 miles of irrigation ditches in Colorado and over 1,000,000 acres under irrigation.—*Denver Times.*

Surveys are being made on the big ditch which is to irrigate the Platte valley in vicinity of Douglas.—*Leader Cheyenne Wyoming.*

Work has commenced on Yakima's big irrigating canal, to cost over \$3,000, 000 and to cover 200,000 acres of choice land.—*Helena Mon.*

A syndicate has made arrangements to take a big ditch out of the Platte near Saratoga that will irrigate 170,000 acres. The final surveys are now being made.

The plan of digging an irrigation ditch from a point near Lexington to Western Hall county seems in a fair way to materialize. As projected the canal would be 30 miles in length and is estimated to cost \$300,000 and to water 150, 000 acres.—*State Journal Lincoln, Neb.*

A large irrigating ditch has just been completed in Scott's Bluff county. It is the beginning of the end which shall make all western Nebraska defy the possibility of drouth.—*Omaha Bee*.

A Mr. J. H. Woods, of Tulose, (Cali.) has sunk a well 90 feet deep, securing an abundant supply of water. By the use of a coal oil Engine, at a cost of 25 cents. per day, he is able to irrigate ten acres of land.

Work is being rapidly pushed on the Burger ditch, which will water land in the vicinity of Palisades and a large acreage a few miles up the Grand from that place. A steam shovel is being used in the work.—*Salt Lake City Tribune*.

A BIG CANAL.—There are quite a number of small ditches dug near North Yakima, (Ore.) but the people are jubilant over the new canal which is to be built in the near future. It is to be about sixty miles in length, and will cost about \$1,500,000. It is proposed to take water out of the Natchez, which is a branch of the North Yakima, a short distance from where it empties into the Yakima, carrying it down below North Yakima and syphoning across the Yakima river. It is expected that this work will consume about two years.—*Ex*.

Secretary Rusk says that the reports of twenty eight irrigation districts have been received at the department of agriculture. The territory covered by these reports is more than 1,500,000 acres. For the construction of works in these districts bonds have been voted to the amount of over \$11,000,000. There seems to be no room to doubt after reading these records that the people here have found a wise and equitable method of resolving the legal and administrative difficulties connected with the use of water as an industrial agent.

BETTER SANITARY REGULATIONS.

A study of the water supply of small towns and cities will convince any one of the importance of better sanitary regulations. The question of the disposal of effete matter is an important and serious one, especially if the water supply is dependent upon wells and cisterns. Their proximity to privy vaults and cess pools should be carefully observed. Let us for example take a single block or square in any small city, note the number of vaults and cess pools, their location, and note also the number of wells and their location; we will be surprised to find their near proximity to each other. The wells receive the drainage of the soil for hundreds of feet around them, depending upon depth, so that they really become the receptacle into which they empty their liquid contents. Cisterns, unless carefully built, receive also their share of drainage, and become a source of typhoid contamination; if, however, properly constructed, they are not as dangerous as wells. They should be cemented both inside and outside, so that drainage into them will be entirely prevented.—*World, N. Y.*

The Decatur Leader Manufacturing Co. recently located at Decatur, Ill., (the Brown & Frazier Co., of Portland, Ind., being dissolved by mutual consent) and made up of some the best business men of that city, together with the experienced members of the old company, are equipped for the manufacture of a full line of clay machinery.

The Scientific Ditching Machine Co., offer to put their machine into the hands of good men upon their merit only. They are highly recommended. Address the Company as above, at Aylmer, Ont., Canada, Box 246.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete; you will have use for many things published and the volume complete will make a valuable book

*J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.*

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten " " " ".....	8 00
Single Copies.....	10

Send for rates for larger clubs.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile. It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers.
It is the best possible medium for those having
tile machinery, brick machinery, kilns, fire-brick,
engines, ditchers, clays, tile yards or second-hand
machines for sale, to advertise in.
The rates of advertising are reasonable.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1.
 Twelve lines Nonpareil type make one inch.
 Liberal discount for longer time and larger space.
 Transient advertisements must be paid for in advance.
 For large advertisements address the publisher for terms.

C. G. Elliott, the well-known farm drainage engineer, is located at Bloomington, Ill. Correspondents will address him at that place.

IRRIGATION, UNDERDRAINAGE AND BETTER CULTIVATION.

The fever for irrigating arid lands in the West and Southwest has attracted brains and capital to an extent that is truly wonderful. Rivers and creeks are being drawn from their natural channels to water the lands for agricultural purposes, covering in the aggregate millions of acres. Artesian wells are being put down, until in one State there are 9,000 in use for irrigating lands that were at one time thought to be worthless for agricultural purposes, until what were once arid wastes are now covered with luxuriant vegetable growth.

Another feature in this connection is, that irrigation farming is mostly confined to small area farming—a few acres. We are glad of this, for it is the small farm well tilled that pays. We have often advocated through the columns of the JOURNAL the advisability of cultivation of less land and do the work better. Where underdrainage is necessary to get rid of the over supply of water, it is the rule to scatter the work of underdraining so as to admit of the cultivation of the largest possible area, when, if the underdraining had been thorough on half the area, and then cultivate thoroughly, less labor would be required, and the net profits would be doubled.

When it is true that men do under-drain thoroughly ten, twenty, thirty or forty acres of land, and then cultivate so as to make more money on twenty acres than thousands of common farmers make on a quarter section, it ought to open the eyes of many. But it is true, that there are only a few of such farmers (intensive farmers) and those on adjoining lands profit but little by the example of their more enterprising neighbors.

But the good time is coming when there will be more of such farming. The irrigating districts will aid in developing

the success of cultivating a less area and doing the work well.

Already wells, windmills, and other means, are being brought into use to irrigate small areas in districts where a few years ago it was thought wholly unnecessary to provide any such means for insuring success in farming or gardening. A little further on we shall see windmills and other powers at work on our farms furnishing the needed supply of moisture in time of drouth.

Drouths were common in the early settlement of the country, and as severe as any we have experienced of late years. So no anti-drainage crank need open his head about tile drainage being the cause of drouth, any more than long continued rainfall. But the good time coming will find the wide-awake farmer with well tiled lands to carry away the excess of water likely to damage the crop when there are rainy seasons, and then means for irrigating when it is dry, so as to insure a good crop every season.

We do not hesitate to affirm that where the work of underdrainage is thorough, the need of irrigation will be lessened materially. Then the air will supply in large part (in this climate) the necessary moisture to the roots of the growing crops, as it circulates through the lines of tile drains and through the soil.

Mr. Cunningham, of the Wallace Mfg. Co., Frankfort, Ind., made a short call recently. He says that their trade has exceeded their most sanguine expectations; that their machinery is receiving the highest praise; that the Automatic Cut-off takes the lead of all.

The New Bremen Machine Co., New Bremen, O., have got well along in extending their trade. They are wide awake to the demand of the clayworking interests.

Miscellaneous.

WHAT MADE THE DIFFERENCE?

In a Western city a few years ago, two lads, apparently each about eight years of age, could be seen daily soliciting the opportunity to "black your boots." Both were orphans and had no one to depend upon who could do more than give good advice, and teach them evenings how to read and write and the first elements of arithmetic. Both boys were industrious and ambitious, and both equally successful in making money. One boy determined that he would save his money and try to be a man among men. So he managed to put about half of his earnings in the Savings Bank, and took great satisfaction in seeing the amount grow. The other boy said: "You are a fool; I mean to have a good time."

Each boy followed his own course, and gradually grew apart, the one avoiding all unnecessary expenses and saving his money. The other used his money, as fast as earned, buying luxuries, cigars, etc., and as he grew to be older began to visit the saloon, having, as he called it, "a good time."

The first boy continued to save, and in a few years had several hundred dollars in bank, and the president advised him to invest in some property which proved fortunate, and his fortune continued to grow until he is now a wealthy man and at the head of a leading financial institution, and a man of influence and universally respected.

The other boy is a poor man, having hard work to make a respectable living. He is a labor agitator, and insists that something is wrong in our system. "There is no chance for the working man," says he. "Corporations and monopolists have got us by the throat, they become rich off our labor, and we do not

have a fair share. I have worked hard all my life, and others, no better than I am, who have worked no harder, are to-day rolling in wealth and luxury. I tell you something is wrong."

There is a lesson here for the young men. If a "good time" is the object to which you aim, the "wild oats" you are sowing will be harvested in due time in poverty and demoralization of character. No system of government will help you. In vain you may preach about the evils that exist and the wrongs that afflict and oppress you. None of these will bring you fortune or a good name.

"Whatsoever a man soweth that shall he also reap."—*Ex.*

SOMETHING FOR NOTHING.

One of the most dangerous foes of the peace and real prosperity of the human family is the idea of obtaining a moral standing without having a basis for it; of obtaining wealth by easy and rapid strides without labor or capital.

When a business firm starts out on such a programme it is classed as a "wild-cat;" when coin of that sort is attempted to be palmed off on the public, it is styled "base" and "counterfeit;" yet we see daily the ingenuity of men taxed to the uttermost to achieve immense wealth, not by the interest on capital invested, but by speculations based on what is not, theirs—the future.

Again, we see men by "ways that are dark," rise to eminence in society, assuming a virtue when they have it not, and the inevitable result is that society is the loser by it. The effort has been made to obtain something for nothing.

In business life, as well as in social walks, the surest, safest and happiest way, is to bed-rock your course on principle.

Business as well as private character should have a solid foundation. The honest toiling farmer, who, for the support of himself and family, gives the strong capital of his brawn and brain, is entitled to a large interest in products of the field, and is entitled to more respect than the man who gambles on grain or railroad stocks, and amasses wealth by deft manipulation and questionable dealings.

The steady mechanic who follows his callings, dealing honestly by his employers as well as by his own family, is worthy of all honor, while he who reaches a commanding position to use it for his own personal aggrandizement is to be condemned and despised.

Honesty is the best principle, and where it prevails to the exclusion of policy, the world will have an honest administration of affairs, honest money, honest effort and honest returns for labor.

He who is guided by the policy of trying to obtain something for nothing, when the calcium light of eternity is turned upon him, will find himself described by the poet:

"Nothing but leaves!
No gathered sheaves of life's fair ripening grain:
We sow our seeds; lo, tares and weeds—
Words, idle words for earnest deeds.
Then sadly find at last,
Nothing but leaves! nothing but leaves!"—*Ex.*

MILK INSTEAD OF MEDICINE.

Leading physician are becoming bolder. Many have courage now to prescribe a certain diet instead of drugs. Is not the food an important factor in determining the character of our future lives? The infant whose mother drinks alcoholic stimulants while nursing it will, three chances out of five, be addicted to use of such stimulants when grown. A weary business man comes home from his office at night nervous and out of temper. A glass of Jersey milk heated to about ninety degrees, sipped a little at a time and no food taken with it or at most a little bread and butter, will do more toward restoring him to happy mind and good physical condition than all the tempting viands that can be placed before him. A lady in Platte county, Missouri, was pronounced incurable. A well known physician in Kansas City advised her to give up all medicine, and, in order to prolong her life, prescribed three ounces a day of a mixture of sweet Jersey cream and sponge cake. Inside of ten days she began to gain in strength. In less than a month she regained the use of her voice, and was able to sit up. In three or four months she was well, and has been well ever since.—*Ex.*

THE DEBASEMENT OF WOMEN.

To complete the ecstasy of those who believe in the degradation of human labor, need I say that at Stockholm the debasement of woman is perhaps more thorough and complete than in any city of Northern Europe? She here practically supplants the beasts of burden. And I am not altogether unfamiliar with woman's work in Europe. I have seen her around the pit mouth, at the forge, and barefooted in the brickyards of "Merry England," filling blast furnaces and tending coke ovens in "Sunny France." I have watched her daily bearing the heat and burden of the day in the fields of the "Fatherland," and in Austria-Hungary doing the work of man and beast on the farm and in the mine.

I have seen women emerge from the coalpits of "busy Belgium," where little girls and young women graduate under ground as hewers of coal and drawers of carts, for it is no uncommon thing in Europe to hitch women and dogs together, that manufacturing may be done cheaply.

Aged, bent and sunburned, I have seen women, with ropes over shoulders, toiling on the banks of canals and dykes in picturesque Holland. Having witnessed all this, I was yet surprised to find in a city so beautiful, and seemingly so rich and prosperous as Stockholm, women still more debased. In Stockholm she is almost exclusively employed as hodcarrier and bricklayer's assistant. She carries bricks, mixes mortar, and, in short, does all the heavy work about the building. At the dinner hour you see groups of women sitting on the piles of wood and stone, eating their frugal repast. They wear a short gown, coming a trifle below the knee, with home-knitted woolen stockings and wooden shoes. Over the head a handkerchief is tightly tied. Those engaged in mixing mortar and tending plasterers wear aprons.

They are paid for a day of hard work of this toil, lasting twelve hours, the magnificent sum of one kroner (equivalent to 26 cents.)

Women sweep the streets, haul the rubbish, drag hand-carts up the hills and

over the cobblestones, unload brick at the quays, attend to parks, do the gardening and row the numerous ferries which abound at Stockholm. The entire dairy business of the city is in their hands, and here they take the places of horses and dogs, carrying on their shoulders the heavy cans of milk from door to door.—*Ex.*

The Dawson Kiln, advertised in our columns, is quite favorably known to many of our readers. See advertisement.

FAVORABLE MENTION of the Adrian Brick and Tile Machine: Seddon & Edwards, Kansas City, Mo., write that they had made 37,000 good brick on the No. 3 Machine in 10 hours. A. F. Edwards, late of Kansas City, Utah, writes that the Enterise Brick Co. of that place are using the No. 3 Adrian Machine, and are making the best brick in town.

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G. & C. MERRIAM & CO., Publishers,

Springfield, Mass., U. S. A.

Caution!—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line, for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.
GEO. L. PEARCE, Guineys, Va.

FOR SALE.

One Brewer Tile Machine with dies from 3 to 10-inch. One Wallace Clay Crusher. Both machines are complete and almost as good as new. These machines will be sold very low. For price, etc., address,
M. J. LEE,
Crawfordsville, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN,
Portland, Indiana.

FOR SALE.

1 ten h. p. Traction Engine,
1 Eureka Tile Mill.
1 Clay Crusher—smooth rolls.
75 Drying Cars—for tile.
For further information, address,
W. D. COVERT, Administrator,
Franklin, Ind.

FOR SALE.

Brick and Tile Works at Cresco, Ia., on line of C. M. & St. P. R. R. Side track into yard. Two good down draft kilns, one No. 6 Brewer Machine and Crusher—only used one season, one 30-horse-power boiler and engine, two dry sheds shingled, one 150 ft. long and one 120 ft. long. As good bank of clay as there is in the State. Am doing a big business. These works are in the best County in the State for sale of tile and brick. No competition. Come and see me or address,
N. B. WHEELER,
Cresco, Iowa.

WANTED, A PARTNER OR MANAGER.

Mr. H. L. Bidstrup, of Washington, La., wants to erect a tile factory at that place, and would like to correspond with some reliable, practical man, who has had experience in making tile, with a view to a partnership in the business, or manager—would prefer a partner. Those who can give good reference and who think they would like such an opening for business will please address as above. 1t.

FOR LEASE.

Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap.
F. C. DEVENDORF, Receiver,
244 South Water Street, Chicago, Ill.

RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental Designs, Paving Tile, etc.

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Tempering Wheels, Trucks, Moulds, Barrows, etc.
Send for circulars.

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DAYTON, OHIO.



The Pullman Car Line
Between

INDIANAPOLIS AND
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The Favorite Line with
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CHICAGO AND CINCINNATI,
ST. LOUIS AND CINCINNATI.
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Pullman Sleepers on night and Palace Parlor Cars on day trains.

Direct connection without transfer in Cincinnati for points in Kentucky, Tennessee, Alabama, Florida and the South.

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Ask for tickets and see that they read "Via C. H. & D." on sale everywhere.

H. J. RHEIN, Gen'l Agent, Indianapolis, Ind. C. H. ADAM, City Ticket Agent, Indianapolis, Ind.

M. D. WOODFORD, Pres. and Gen'l Mgr. Cincinnati, O. E. O. MCCORMICK, G. P. and T. A. Cincinnati, O.

FOR THE
ANNUAL MEETING
— OF —
GERMAN BAPTISTS
AT HAGERSTOWN, MD.
May 28 to June 5, 1891,

THE
BIG FOUR ROUTE

WILL SELL
EXCURSION TICKETS
AT THE LOW RATE OF
ONE FARE FOR THE **ROUND TRIP**

Tickets will be on sale May 20th to June 1st, inclusive, and will be good for return passage up to and including July 2d, 1891.

Liberal STOP-OVER Privileges

Will be granted and side-trip excursion tickets will be sold from HAGERSTOWN to all points in Maryland, Virginia, and West Virginia at Half Rates.

BE SURE your tickets read via the
BIG FOUR ROUTE.

For full information as to tickets, rates, and time of trains, call on or address Big Four Agents.

D. B. MARTIN,
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**CINCINNATI
SEWER PIPE COMPANY.**

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitriified Stone Sewer Pipe we Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,

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**STRONG,
WELL-BUILT
SERVICABLE**

STEAM ENGINES

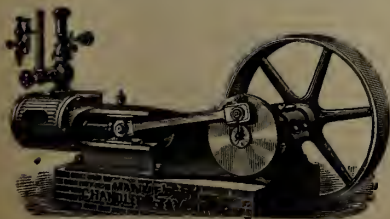
12 TO 80 HORSE POWER.

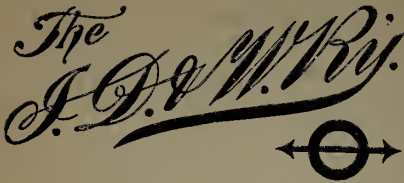
Adapted to Heavy, Continuous Work.

Every Engine Tested Under Full Load.

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CHANDLER & TAYLOR CO., Indianapolis, Ind.





Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.22 pm. (daily.)
Ar Decatur	2.45 pm.	3.55 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.15 pm.	7.12 am.
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Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin Bluffs, and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, JNO. S. LAZARUS, City Ticket Agent. General Fr't and Tkt Agt.



LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday.....	7:30 a. m.
Arrive in Chicago 2.30 p. m.	
No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily.....	11:10 a. m.
Arrive in Chicago 5:00 p. m.	
No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily.....	1:15 a. m.
Arrive in Chicago 7:55 a. m.	
No. 18—Monon accommodation, daily.....	6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday.....	11:55 p. m.
Arrive in Indianapolis 8:55 a. m.	
No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily.....	9:55 a. m.
Arrive in Indianapolis 3:55 p. m.	
No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily.....	9:30 p. m.
Arrive in Indianapolis 3:55 a. m.	

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.
I. D. BALDWIN, D. P. A., Indianapolis.
JAS. BARKER, G. P. A., Chicago.

**BIG
4
ROUTE**

The Shortest and most Direct Route

**East, West,
North, South.**

Solid Vestibule Trains,

CONSISTING OF

The FINEST COACHES, PARLOR, RECLINING CHAIR, CAFE and DINING CARS; WAGNER COMPARTMENT, BUFFET and STANDARD SLEEPING CARS.

Heated with Steam and Lighted by Electricity,

FORMING

The FINEST TRAINS in AMERICA or THE WORLD.

Its SUPERB TRACK and UNRIVALED MACHINERY and EQUIPMENT permit the HIGHEST SPEED with PERFECT SAFETY.

It is the only line which lands its passengers at the GRAND CENTRAL DEPOT in the heart of the great city of NEW YORK, which is an advantage of NEARLY TWO HOURS in TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others, passing through the famous CITY OF PULLMAN, along the LAKE FRONT, and the far-famed MICHIGAN AVENUE BOULEVARD, in full view of the finest RESIDENCES and PUBLIC BUILDINGS. In fact, its Connections and TERMINAL FACILITIES at all points are superior to those of any other line.

Its trains enter the Central Union Station, CINCINNATI; the Union Depots, CLEVELAND, BUFFALO and ALBANY; the Grand Central, NEW YORK; the Boston and Albany, BOSTON; the Union Depot, ST. LOUIS; the Union Depot, PEORIA; the Great Central Depot, CHICAGO; the Union Station, INDIANAPOLIS, and numerous others in the vast territory it traverses between the MISSISSIPPI RIVER on the west; the OHIO RIVER on the south; the GREAT LAKES on the north, and the principal SEA-BOARD cities in the east.

The Indianapolis Offices of this great line are located at

**No. 1 East Washington Street,
138 South Illinois Street,**

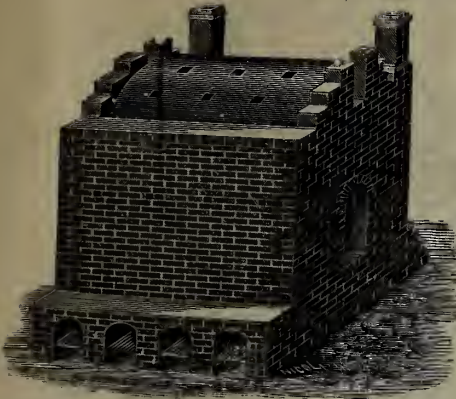
and the UNION STATION, where tickets can be procured to all parts of the UNITED STATES and CANADA and MEXICO, at the lowest current rates, and full information as to routes, conditions, connections, etc., etc.

OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

H. M. BRONSON, Ass't Gen'l Passenger Agent Indianapolis, Ind.

DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

W. E. DAWSON, Agent, Colfax, Ind.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



Manufactured by

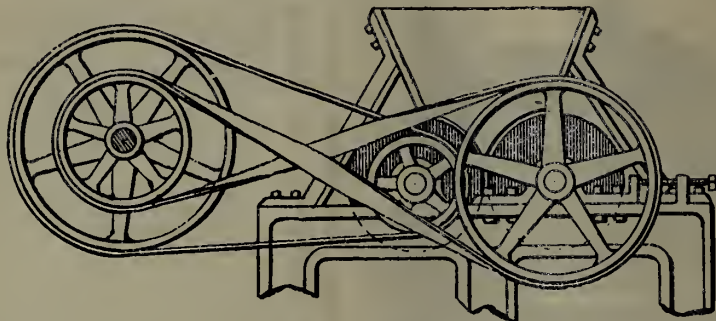
MARION STEAM SHOVEL CO.,

3

MARION, OHIO.

THE Crusher and Disintegrator.

PATENT APPLIED FOR.



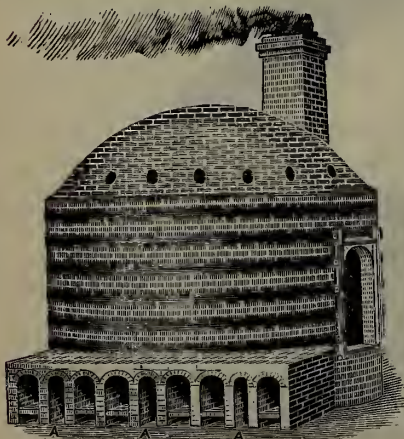
The simplicity of construction and efficiency of machinery, always desirable, commends this machine to general use. After a continued and thorough test, it is believed by those who are using it that the crusher and disintegrator, as above illustrated is superior as a crusher, as a disintegrator. Requires less power to run it. It's not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.

Carter's Scientific Ditcher

Patented Feb. 11, 1890, in the United States, Canada and Great Britain
By Henry Carter, Albion, N. Y.



We take pleasure in offering to the public a long felt want, and the only thoroughly practical Ditching Machine yet invented for all kinds of soil. Permit us to say this machine is not an altogether new and untried one, but is the outgrowth of twenty-five years' hard labor and expense to the inventor and others, in which he has progressed step by step, until now we are able to offer to the public the greatest invention of the nineteenth century to lower the expense of tile draining.

We guarantee this machine to cut from 200 to 500 rods of ditch in ten hours to a depth of more than three feet and leave it 14 inches wide on top, and 10 inches on the bottom. It is so arranged that the operator has it under entire control from his seat and can adjust the cut on plow for leveling the bottom of ditch so as to leave it practically ready for tile. The machine works automatically in all its movements so that the operator has little to do but drive his horses. It is simple in its construction, consequently not liable to get out of order, and we guarantee it to be the most durable Ditcher made. We further guarantee our machine to do more work in less time and with less expense than any machine yet invented.

We further guarantee our machine to be 25 per cent. ahead of any other Ditcher made for any class of soil, and if it is not, we will give \$100 to any public institution in the State where the test is made.

If it is not 50 per cent. ahead of any machine made for any class of soil, we will present any public institution in the State where the test is made with \$100.

If it is not 100 per cent. ahead of any other Ditcher made, for tough clay mixed with gravel and cobble stones, we will present any public institution in the State where the test is made with \$100.

We give full guarantee with every machine sold. For further particulars write to

The Scientific Ditching Machine Co.,

BOX 246, AYLMEER, ONT., CANADA.

Or to HENRY CARTER, ALBION, N. Y.

ERTEL'S VICTOR
SHIPPED ANYWHERE TO OPERATE
ON TRIAL AGAINST ALL OTHERS

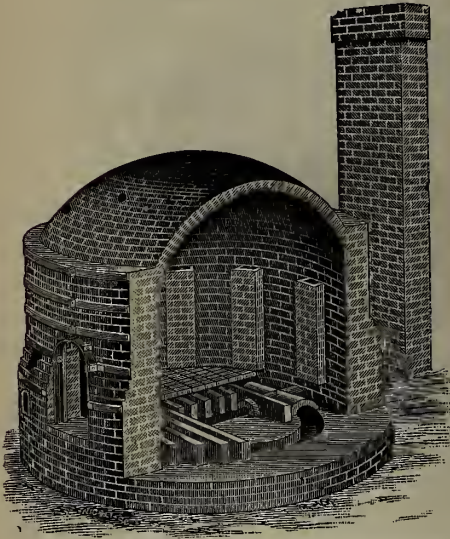
HAY PRESS
PURCHASER TO KEEP ONE
DOING MOST AND BEST WORK
FOR THE MONEY

GEO. ERTEL & CO. QUINCY, ILL.

CHAS. A. NICOLL
WOOD AND PHOTO
ENGRAVER.
23 HUBBARD BLK. Indianapolis Ind.

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT+LEADS+THE+WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "New Discovery" in actual operation.

We shall protect our patents from infringements.

Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

÷-New and Improved Brick and Tile Kiln÷-

PATENTED JULY 31, 1883.

This Kiln is offered to the Brick and Tilemakers of this country, as the best known in use.

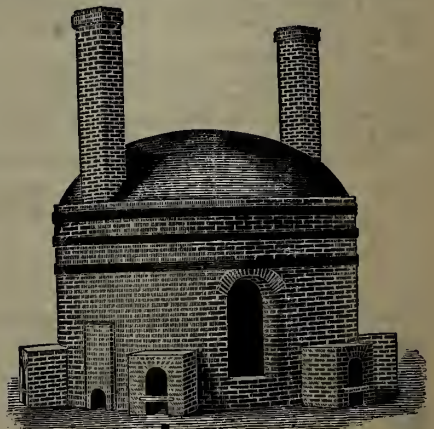
This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



J. B. GRAWCOCK, Churubusco, Ind.

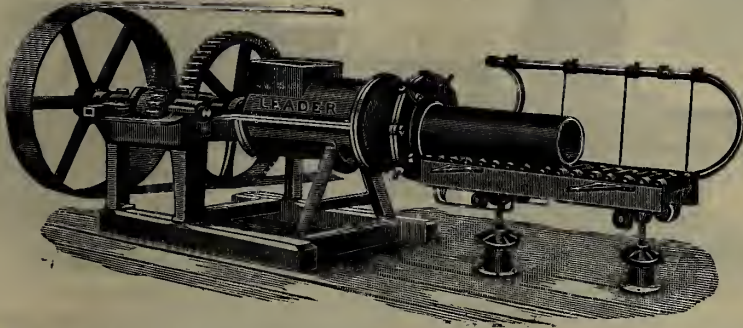
Advertisements.

The Decatur Leader Mfg. Co.,

DECATUR, ILLINOIS.

—MANUFACTURERS OF—

Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,

Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR

CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



SECTION OF CONVEYOR.

ELEVATORS

FOR TILE,
BRICK,

PACKAGES, ETC.

Roller & Detachable

CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

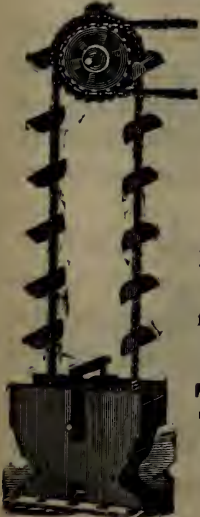
BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '88 Catalogue and prices

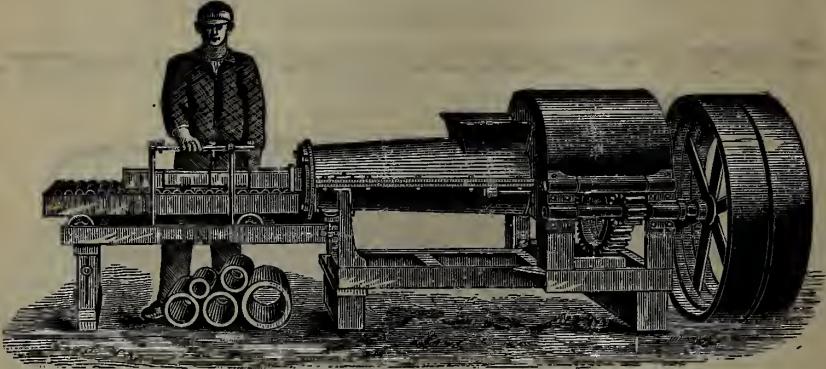
ADDRESS

The Jeffrey Manufacturing Co.,

112 East First Avenue,
COLUMBUS, - - OHIO.



KELLS & SON'S IMPROVED
Brick and Tile Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

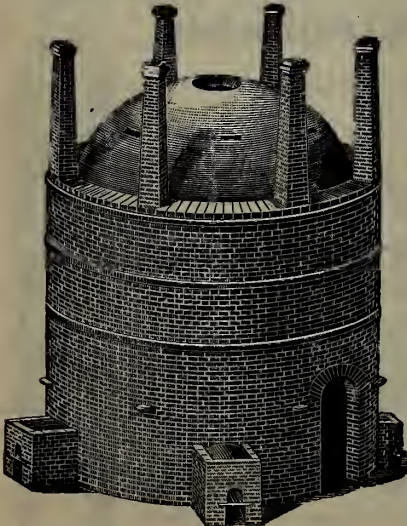
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

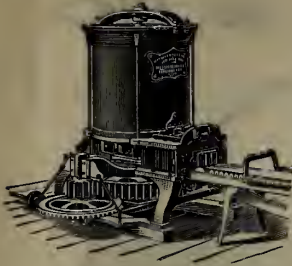
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

64 Johnson Building,

CINCINNATI, OHIO



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS.

Dry Cars ;
Clay Cars ;
Turn
Tables
and
Kiln
Castings.

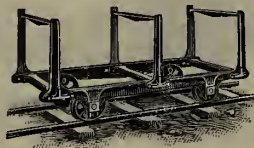


Pulleys ;
Shafting ;
Hangers ;
Barrows
and
Yard
Supplies.

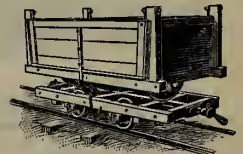
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



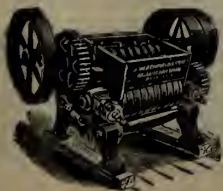
(Dry Car.)



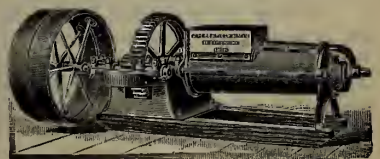
(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.

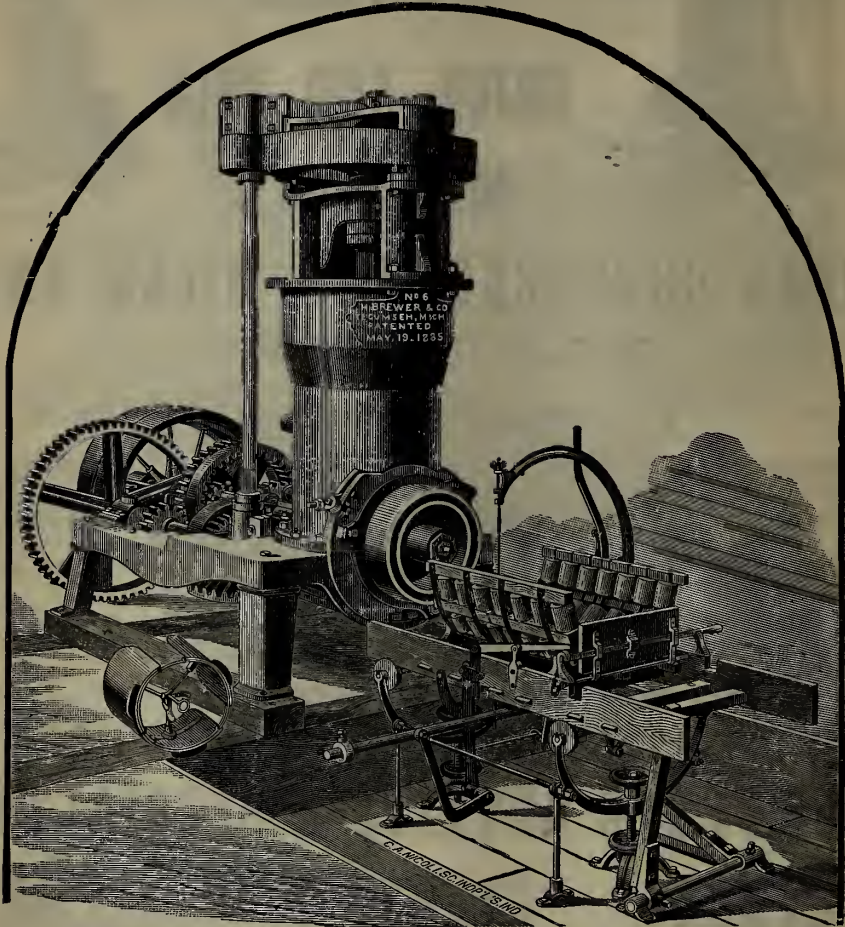


(No. 3 Crusher.)



(No. 7 Pug Mill.)

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile 16½ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, 16½ inches long.

Yours Truly, M. J. LEE.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machines.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

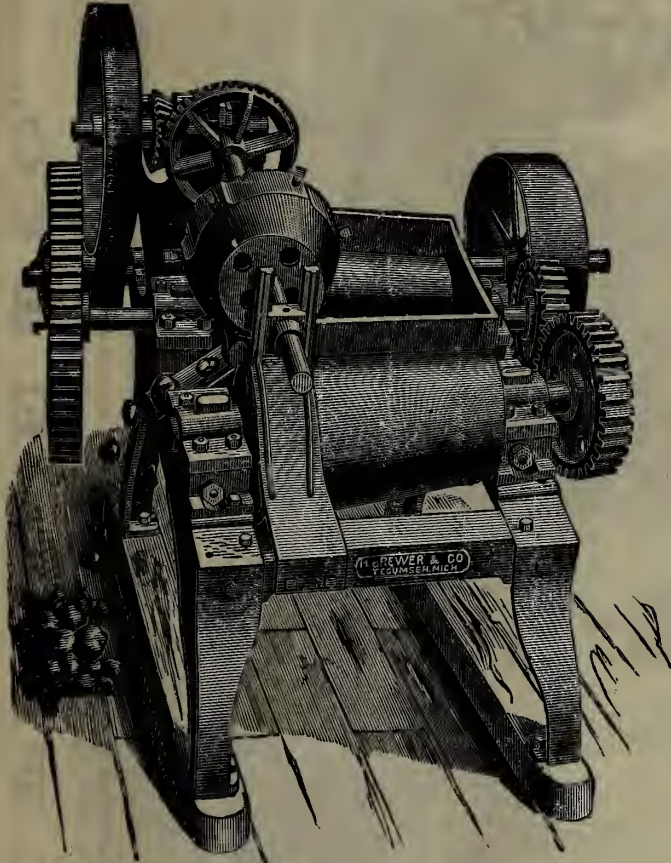
Yours Truly, JOLIET MOUND DRAIN TILE CO.

The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. *It uses neither bridge or hollow shaft.* Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. *Equally well adapted to the manufacture of both large and small tile.* It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

- The following are among the advantages claimed for this form of construction:
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
 - 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
 - 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
 - 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
 - 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
 - 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
 - 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
 - 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

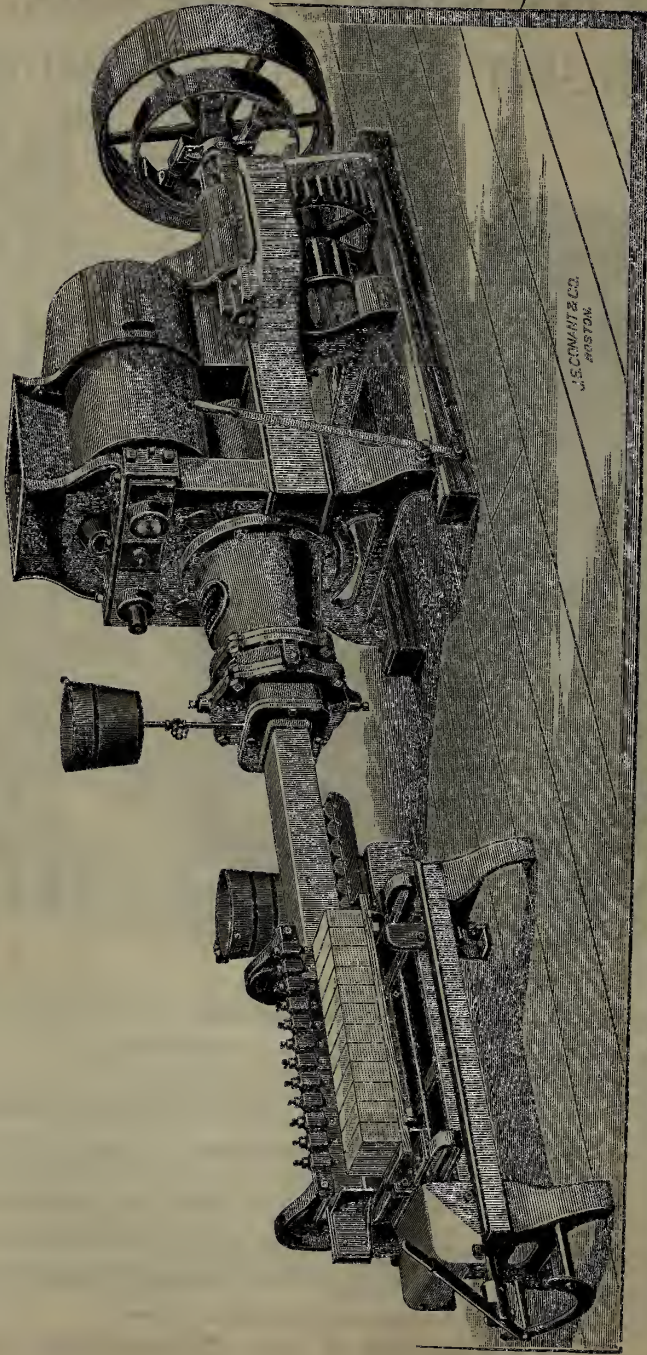
For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



"A" OF Largest Size Machine with New Board Delivery Cutting Table.
Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

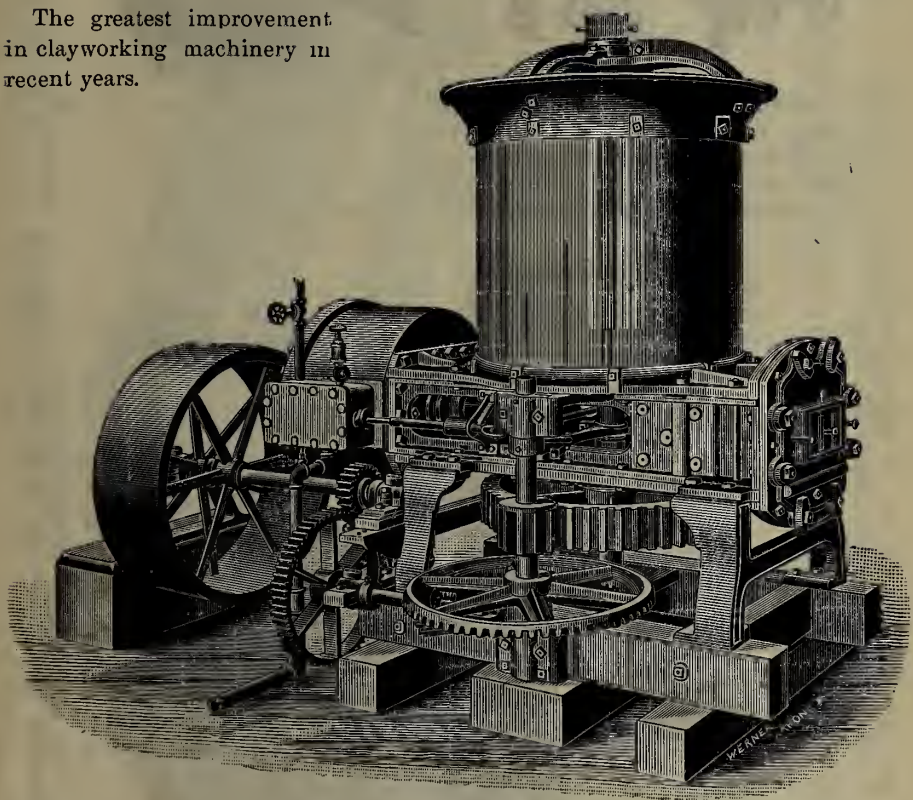
E. M. FREESE & CO.,

PLYMOUTH, Richland County, OHIO.

[Mention this paper.

The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



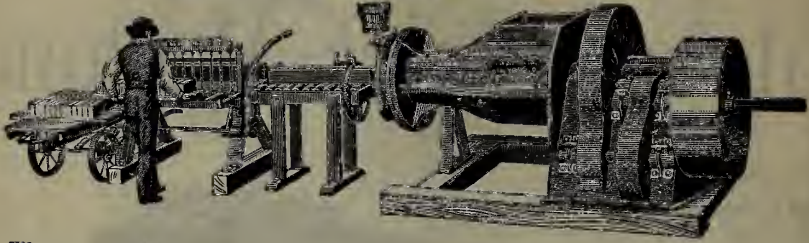
PATENTED APRIL 14, 1891.

For full information and circulars address

THE NEW BREMEN MACHINE CO.,
New Bremen, Ohio.

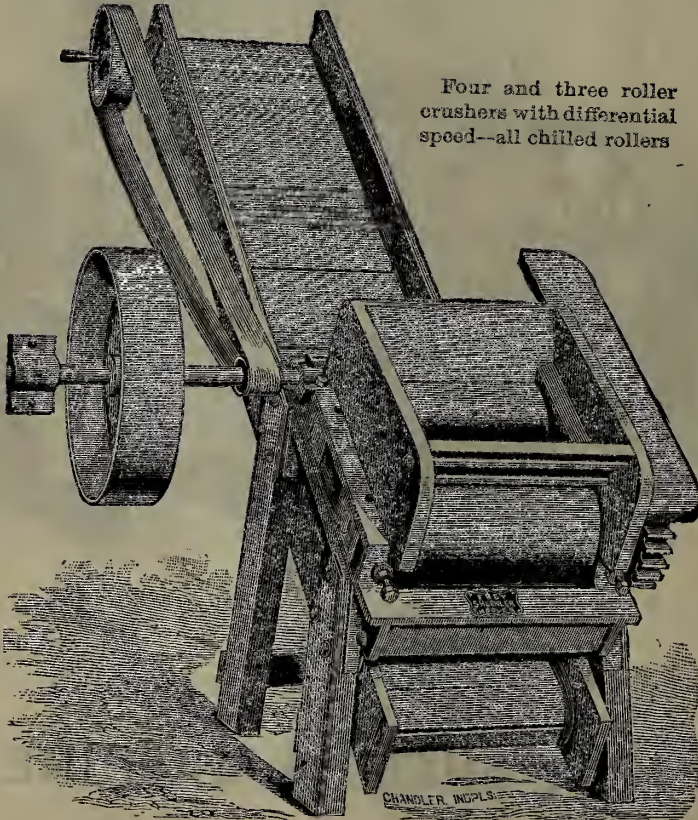
FREY--SHECKLER CO.

BUCYRUS, OHIO.



The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.
The Mascot—the lightest running.
The Centennial—the best clay mixer.
We furnish full outfits for brick and tile factories.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.



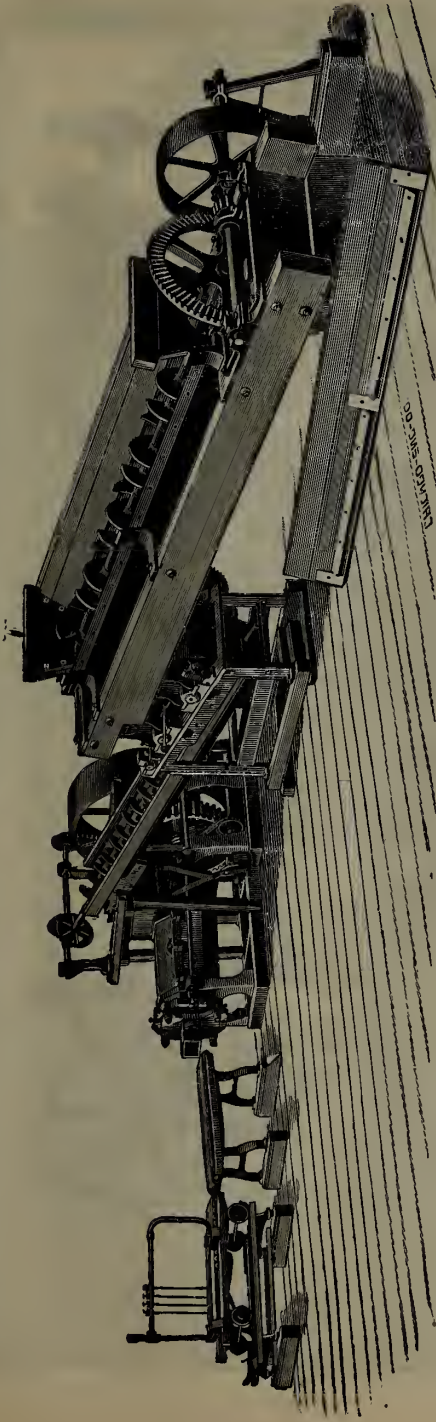
Four and three roller
crushers with differential
speed—all chilled rollers

Six Different Truck Machines; four Different Tile Machines
Crushers, Represses, Kiln Doors, Kiln Irons, Grates,
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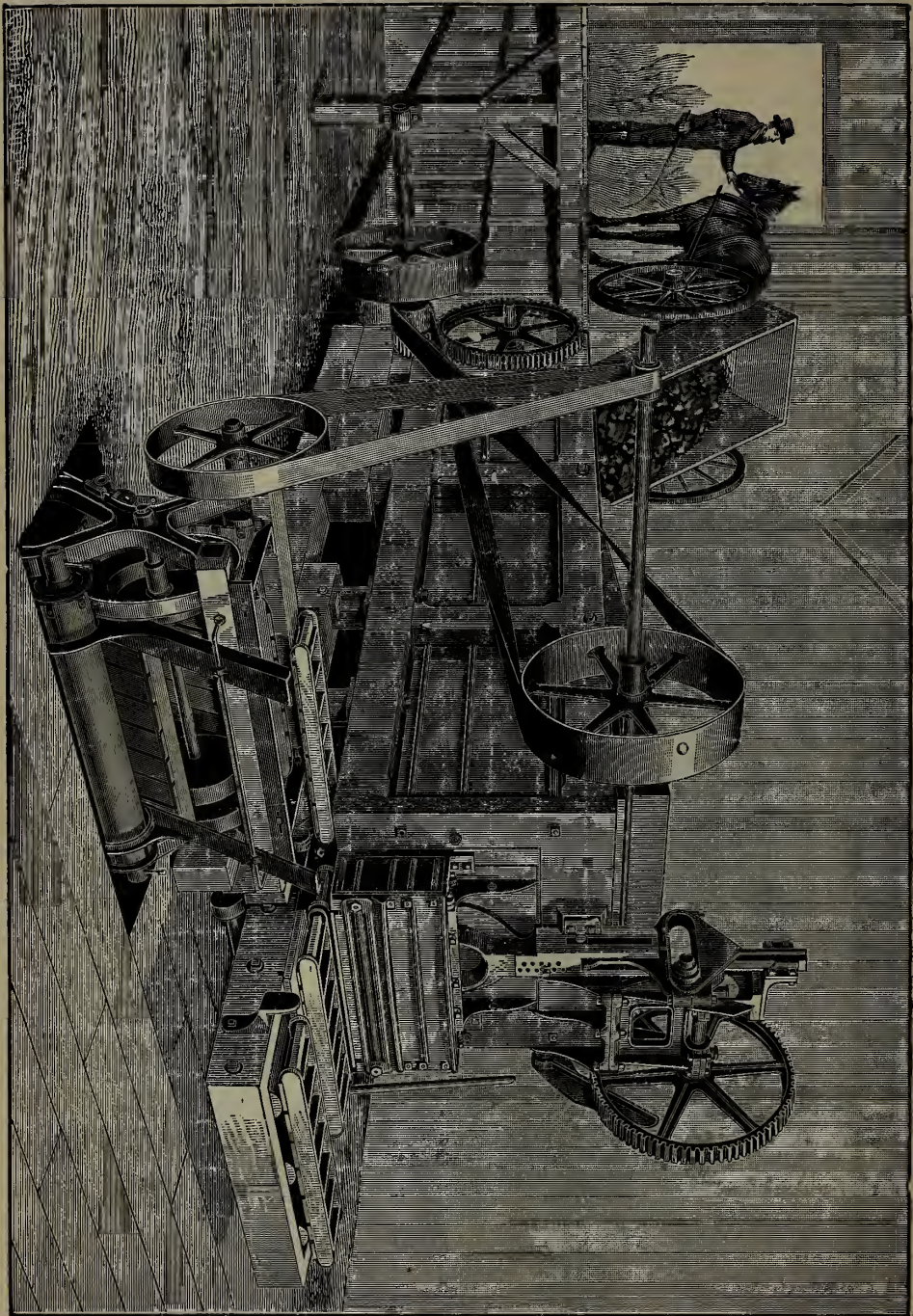


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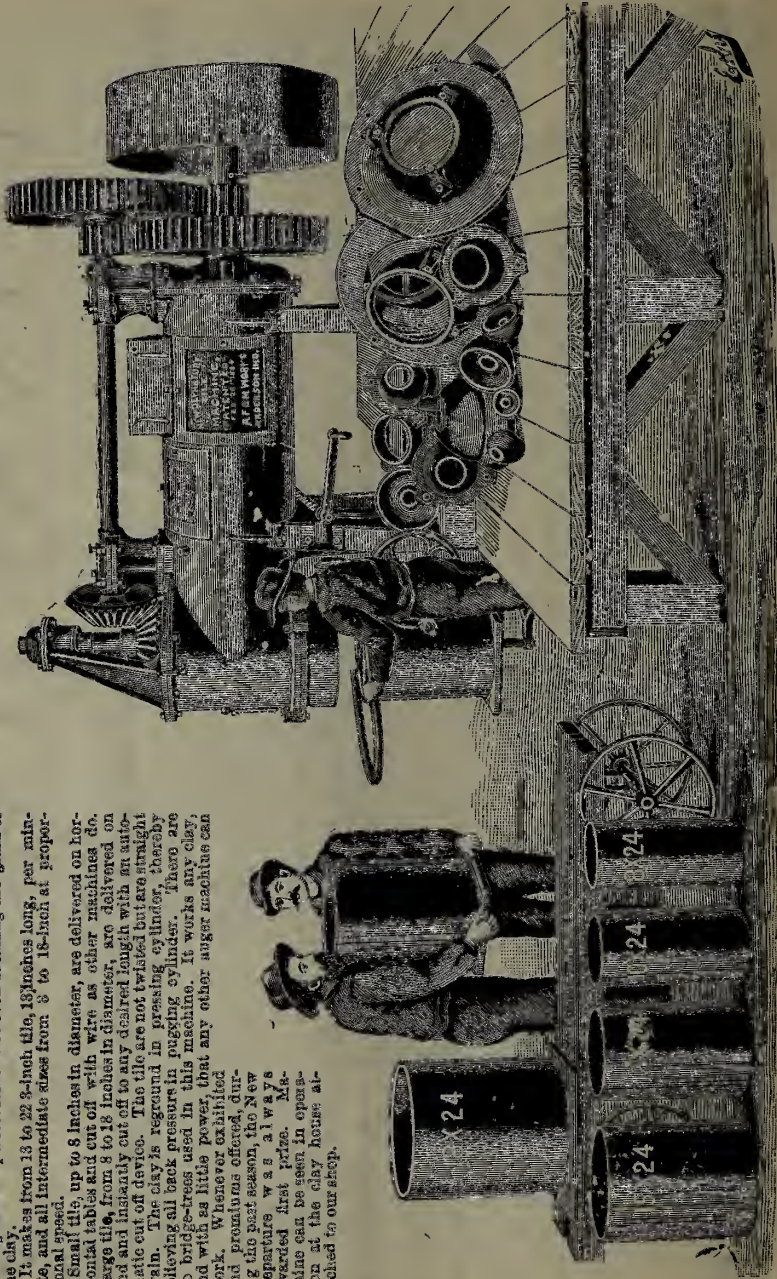
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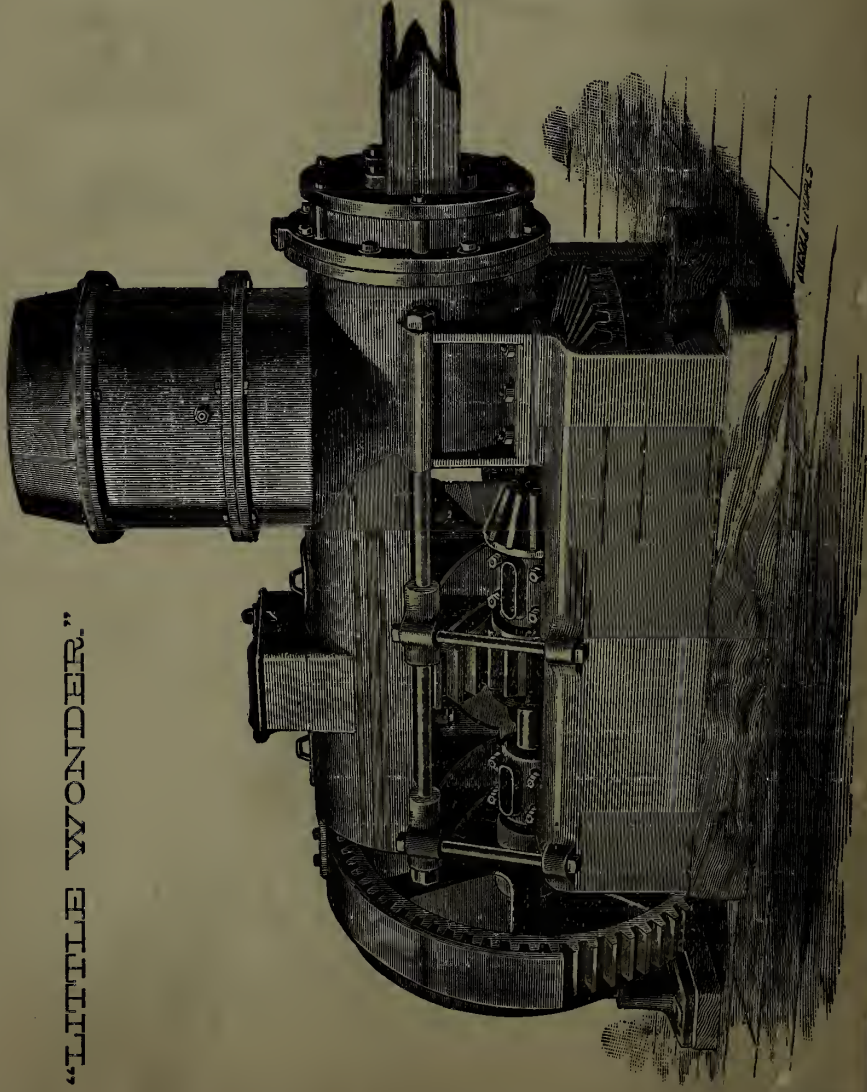
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THE DRAINAGE JOURNAL

JULY, 1891.

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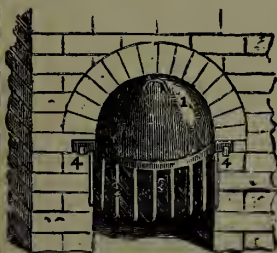
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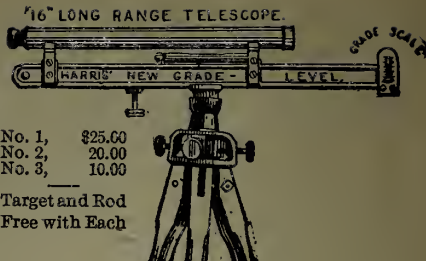
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THE DRAINAGE JOURNAL

Vol. XIII. JULY. No. 7.

SOME FACTS AND FIGURES ABOUT DRAINAGE.

*BY F. J. BEATTY.

About six years ago I made my first attempt at draining my garden. Having read something of the benefits of underdrainage, I tried to buy a few tiles but the best price I could get them for, I think, ten cents a foot for 3-inch and a proportionate amount of larger sizes. This nearly scared me out of the notion of underdrainage, for the plans I had made called for 1,000 feet of 3-inch and 500 of 4-inch, or over \$160 for half an acre of garden was more than I could stand. Well, I concluded to try a wooden one and see how it would work; so I dug one line across my garden about 3 feet deep and put in two boards 2x8, about four inches apart at the bottom and leaning together at the top, making about the capacity of a 2½-inch tile, and awaited results. The garden was a heavy clay soil where large firs had been, and there would often be from six to eight inches of water on it for weeks in the winter time. I put the drain in on the east side (with a branch near the center to the lowest point) and about two feet from a row of fruit trees. The drain did very well the first winter, taking off the water nicely except a few days of the heaviest rains; the trees along the drain just boomed ahead of

the rest, and by fall were apparently a year ahead of the other trees in the garden. But the next winter the water seemed worse than ever. It almost covered the garden, and the flat land back of it furnished enough water to make a stream six inches deep and two feet wide across my garden and through my woodshed. The gophers or rats had filled up the drain, and it was as though it was not. About that time a Mr. Nash started a little tile factory in North Salem, now owned by Murphy & Desart, as an auxiliary to his crockery business, and he offered me tile at \$12.50 per thousand feet for 2½-inch and \$15 for 3-inch, so I bought about \$20 worth and proceeded to drain that garden again. Then came the tug of war in getting my tile ditch dug. I had heard that it could be put down four feet deep for about 30 cents per rod. We—that is myself and about five men—worked about two weeks on that 1,500 feet, and worked hard. We tried spades and shovels and picks and plows, and after the tile was in I knew lots more than I did about tile ditching, also the cost of one. Well, in the meantime, I had been figuring on some kind of a machine to take the place of muscle in ditching, and in writing to Eastern parties about such machines I got a sample copy of the DRAINAGE JOURNAL, and it was an eye-opener. I found that there were tools made especially for that work—spades

*Before the Oregon State Horticultural Society.

18 and 20 inches long, and curved scoops for making the bottom to fit the tile. I had cut the sides off an old shovel and left a five-inch blade and a long handle. This did pretty well, and I still use it for throwing loose dirt out of the bottom. I found that the ditching machines cost from \$200 to \$1,200 and would not work among roots, and thus were not available. That drain works yet, and you would be astonished at the amount of stuff that has been taken off that half acre.

Then about that time I became convinced that prunes would be a profitable crop to raise, and so I started to prepare a place for an orchard. The ground I had selected was covered with a large fir brush and trees; a heavy clay loam, about eight inches black loam, about a foot of yellow clay, and then layers of clay and quicksand alternately, the layers of quicksand getting thicker gradually until about twenty feet down it is almost pure quicksand. There is a hollow running across the northwest corner, at the lowest point eighteen feet below the main part of the eleven acres which is very flat, with a slope toward the hollow of about six inches in two hundred to four hundred feet. I found in digging around on my place that these layers of clay are not level by any means, but pitch at all kinds of angles. On the west of my place they rise toward the north. Therefore, where the surface slopes down to the north the water accumulates until it runs over the edge and then all the water remaining must be evaporated in the spring, making the ground cold and wet until quite late. I put my tile in every fourth row of trees, or sixty feet apart, with a main, thirty feet from the north side, running west. The main is down about five feet deep, on an average—one place it is six feet. The laterals average four feet in depth,

with a fall of one-half inch to the rod. The main is graded to one inch fall per rod. This is the main system and drains about seven acres. Total cost, \$152. The remaining three acres I put in differently. The main here runs diagonally across to the northeast, along the brow of the hill, with laterals every sixty feet as in the others, only the laterals here come in at an acute angle. Then I put in a line parallel to this, half way down the hill, to prevent wash, and then one line along the lowest depression nearly parallel with the last, then a short line on the other slope, and this completed the job. Total cost, \$225 for 10½ acres. Results: I can plow or work the ground almost as soon after a soaking rain now as they can on a sandy soil on the river bottom, and it turns up mellow like an ash heap. My trees are about a year's growth larger than trees of the same age in the neighborhood, on undrained soil. This is about all the difference that I can certify to at present, as the tile in the oldest part of the orchard has only been in two winters. I am told that there is a difference in the matter of late frosts in the spring that sometimes makes a difference in the fruit crop of half or more, and anyone can get an idea of how evaporating of water cools the soil, by dipping a hand in even warm water and holding it in the wind. Now if this water is taken out from below, the warmth of the sun is sooner taken up by the soil, and this must make some difference in the time of frosts, so the theory looks reasonable. And if this tiling should make a difference of half a crop of prunes once in ten years, I am satisfied with the investment as an insurance policy; because if this is put in right once, it is ready to work for all time. Your great-grandchildren's grandchildren will not see the end of its usefulness. In the matter of stopping surface wash-

ing during hard rains on steep grades, alone, it is of great value. I find that since putting in my tile no water runs over the surface, even during the hardest rains, where formerly there was a stream of from six to eight inches deep and a foot or more wide, washing out enough silt in one winter to cover a place of 100 square feet to the depth of seven or eight inches. This was the richest and finest of the top soil that was carried off. Now if I put on manure it will do some good, instead of being carried off toward the ocean.

Now as to the capacity of the different kinds of tile: With a fall of one inch to 100 feet, a 2½-inch tile will carry all the water that can get into 40 rods of it. If your line is 80 rods long, use 3-inch for the lower end. Anyone can compute the relative capacity of tile by the old rule of finding the area of a circle; viz., multiply half the diameter by half the circumference. Thus a 3-inch tile, 1.5x4.5 or 6.75; a 4-inch is 2x6 or 12, or nearly double the capacity, and the difference only one inch of diameter. Take the same grade, and a 4-inch tile carries about as much water as three 2½-inch or two 3-inch. My largest main is only five inches in diameter for the last 180 feet, but the increase of grade from one-half to one inch to the rod makes it carry all the water from over 400 rods of 2½, 3 and 4-inch tiles, on a grade of one-half inch to the rod; and it has never been entirely full yet, though I expect after the ground gets a little more porous that it will tax the full capacity of the 5-inch main. One thing I noticed this winter was that an open ditch of three feet depth would not take the water from seven or eight feet away, yet a tile in the same field four feet down kept the waters from showing on the surface at the same time, over 30 feet on each side. But this may have been

caused by the layers of clay, I have mentioned, being in position to hold the water out of the open ditch. I don't know, only the fact that it was so.

METHOD OF LAYING TILE.

I now lay off the lines of main and laterals by stakes, and then plow out two or three furrows each way, making the deadfurrow about as near grade as possible, by running shallow or deep as necessary. I can get down generally about a foot this way. Then with a pointed shovel I clean out and cut off the high places and get as near the right grade as possible. Then come in the long tile spades 18 to 20 inches long. Stretch a line and dig first trench 8 to 10 inches wide and stick the spade in full depth every time and hold the handles always at the same angle so the bottom will keep the same grade as the top. The next spade must be cut the right size for the kind of tile you use, but it is as easy to cut four inches wide as any smaller size. I never use less than a 4-inch blade for the bottom cut. April and May is the best time of year to put in tile here, as then there is always a little water in the ground and thus one can cut off the high places so that the water never stands over one-fourth of an inch deep, and get a nearly perfect grade. Begin at the lower end and put in tile with a tile hook, made of three-eighths inch iron rod about 15 inches long stuck in the end of a 7-foot pole and bent at right angles. With this hook I can stand on the top of the ground and place the tile in position better than any one can standing in the ditch and putting them in with the hands. The tile should be bedded, that is, put on about four or five inches of dirt tramped down well. Stand in the ditch to do this; use a hoe or light shovel and see that the tile is not moved out of position. To fill the ditch I use a 14-inch plow and a V

scraper. Plow up one side and down the other, two rounds. With the scraper you can walk the horse in the furrow and the wing of the scraper pushes the dirt into the ditch; use plow and scraper alternately, until full; costs about two cents per rod to fill, of course. The junctions of the laterals and main has to be filled up by hand for a few feet, so the horse can cross. Usual price for filling by hand, 5 to 7 cents per rod. As to depth: A man could not put in tile for me, less than forty inches deep, if he was doing it for nothing and board himself. I consider four feet a good depth, with main eight inches deeper.

If you want to learn all about it, send for the DRAINAGE JOURNAL, as I did, and you will never have cause to regret it.

Gentlemen, I am done.

DRAINAGE AND IRRIGATION.

"He sendeth the spring into the valleys which run along the hills; He watereth the hills from his chambers and the laughing abundance by which the mountains are crowned in consequence of it. The little hills rejoice on every side. The pastures are clothed with flocks; the valleys are covered over with corn; they shout for joy; they also sing."

So sang one of the sweet singers of Israel. If the text prove the better part of the discourse, it will be what often happened to preachers before.

All cannot build their houses upon the rocks, nor upon the sand; neither can we always build upon a hill nor upon dry ground, but we can make the ground dry. Defective drainage is the cause of the many ills of rural life. Many diseases find their causes in that source. Of discomforts so caused there is no end. Among reforms needed it is certainly one of the first importance. Very many luxuries are not attainable in country life, but the comfort of dry

ground by good drainage requires only thought and labor. Being necessary to health and comfort should be argument enough to induce every rural home owner to secure proper drainage where nature has not already provided it, which nature rarely does, for with the single exception of sand or sandy loam, all soils are improved in their healthfulness whereon to locate homes and also in their fertility, by drainage.

Not being an engineer, I shall not enter into the technicalities of drainage. A few general principles may be taken as established by science and experience. Tile drainage, using round tile with collar joints, is best for garden and lawn and for all fields where long roots may reach the bottom of the drain. The tile should have an opening at the head as well as the outlet to maintain circulation of air, as one of the great advantages of under-drainage is in the circulation of the air through the soil, making it light and warm and adding to its fertility.

A century ago Thomas Jefferson, the leading horticulturist of his day in this country, spoke of the fact that "Air is the great fertilizing agent."

The depth at which tiling should be laid and the size of same, depends upon the location and the quality of the soil. Figures to suit in one case would be misleading in another. The length of the purse will also enter into in our calculations. We must sometimes cut our garments in proportion to the cloth, while at other times we may robe the wearer regardless of measurements.

Old Elkington taught our English ancestors how to draw the water off their wet lands a century and a half ago and Johnson quaintly tells the story of the wonderful work. The English being, as they say, very "conservative" but as the Yankee would say, very "plodding," it required many years to introduce the

system, yet the lands round about Sherwood Forest, "The Dukeries," are living examples of the efficiency of underdrainage.

Fifty years after Elkington taught the gardeners how to keep their places comfortable to the livers and wonderfully productive, Thomas Jefferson made a tour through southern France and along the shores of the Mediterranean Sea, then called "the garden spot of Europe" and extended his tour through the gardens of England which he pronounced the finest in the world. Something, no doubt, was due to the superior skill and industry of the English over the Continental gardens and something to their use of manure, but much was also due to the sub-drainage and irrigation of their grounds. The skill some of them displayed and the capital they invested in thus improving their gardens showed that they fully appreciated what Elkington had taught them.

Home grounds and gardens are sometimes so favorably situated that the drainage can be utilized for convenient stock water, for an ice pond, fish pond or other purposes with but little additional expense. In some cases there are streams of water that can be turned so as to provide water for irrigation purposes. When streams are not so available, the water can often be obtained by means of hydraulic rams wind mills and other comparatively inexpensive methods; or the water from the drainage reservoir may be utilized. In such instances, where practicable, a combined system of sub-drainage and irrigation can be advantageously established.

The same tiling has been used for both purposes, leaving them open in wet weather to secure drainage and closing the outlets in drouths for irrigating the ground. But a better plan is to put in two sets of tiling, the irrigating tile at a

foot and a half to two feet and the drainage tiling three or four feet. Experiments made in a number of places have demonstrated that sub-irrigation is preferable to the surface method, especially on rolling lands or on clay lands that "bake."

Irrigation is not so essential in the eastern states as in the arid plains of the west, yet it is often practicable and profitable. Only a few years ago a Vermont farmer published the result of his experiment in making an irrigating pond by building a stone dam across a ravine, and the increase of crops in the first year more than paid the whole expense without counting the ice from the pond or the fine outlook he had for fish. Once properly made the expense is but a trifle and perpetual drainage and irrigation supplied. Think of the refreshing beauty of a blue grass lawn sub-irrigated, when the browning effects of a drouth are everywhere witnessed, to say nothing of flowers and fruits growing finely because they have a full supply of air and moisture at their roots.

Tests made in England showed that the yield of grass was increased 30 per cent. by sub-irrigation over that of surface. Before the land was irrigated in either way it was a barren heath, not even affording sheep pasturage, but six tons of hay per acre were realized by drainage and sub-irrigation.

A practical test made by a Texas gardener shows the following: A reservoir 30 feet square and 5 feet deep will hold 40,000 gallons. A 12 to 14-foot wind mill in a favorable location and with a good pump attached will fill in 10 to 12 hours. That amount of water will cover two acres an inch deep but in sub-irrigation would suffice for four acres. These facts show that it is feasible in nearly all instances to drain and irrigate home grounds and gardens, if not entire farms,

and that the increased bounty, productiveness and healthfulness would more than repay the cost of the work in a very short time.

"We must teach by example," says a New Jersey horticulturist. Let the readers of *The American Garden* who are amply able to put these statements to the test, employ drainage and hydraulic engineers, establish drainage and irrigation systems on their home grounds and gardens and in a few years these examples will have spread and they will not only increase their own pleasure and comfort but will deserve and secure the credit of being pioneers in a great reform.

—J. P. Applegate in *The American Garden*.

SOIL IRRIGATION.

BY W. S. BURKE.

Since the subject of irrigation is attracting the attention of farmers in some sections of the country to a considerable extent, those of your readers who are engaged in agricultural pursuits might be somewhat interested in knowing what farmers in this portion of the country have learned about the matter by experience. I have tried farming in Ohio, Iowa and Kansas and am now engaged in the same business here. In the three states named, except in portions of western Kansas, the farmer depends upon the clouds for his moisture, and if they give him too little or too much his crop is a partial or total failure.

Statistics show that in all rainy countries—that is where the farmers depend upon the rains to make their crops—the seasons of drouth and the seasons of too much rain constitute three out of every five, giving the farmer three bad crops to every two good ones. On the other hand, in a country like this, which is recognized as arid and where nobody hopes or tries to make a crop without

irrigation, such a thing as a crop failure is unknown, because the water is always taken from some reliable source, the ditch never runs dry and the growing crop always gets the water when it needs it and never at any other time. With good soil and plenty of sunshine, there is nothing required but proper cultivation and a well regulated water supply to insure a good crop every year. The good soil and the sunshine, this country possesses in a very unusual degree. We have the "early and the latter rains," that is, in the early spring and the latter part of summer, but during May, June and July, and generally August, rain enough to do any good to the growing crops is unknown, therefore the first thing for the new settler to do is to provide himself with a water supply sufficient to irrigate whatever land he proposes to cultivate. The usual way of doing this is to "take out a ditch" from some stream at a point four or five miles above where the water is to be used, or far enough to carry the water clear above the land to be irrigated.

This is done by the people of the whole neighborhood, and each individual then has his sub-ditch connecting with the main one and has certain times at which he may use the water. The main ditch is under the charge of one of the persons interested who is chosen every year for the purpose. His duty is to see that the main line is kept in order and for that purpose he may call out, at any time, all those who use the water for the purpose of repairing or cleaning out the ditch. This requires, on an average, about three days' work for each person each year and that represents the entire cost of the water supply. The hours at which the different individuals may use the water supply are arranged as to not allow anybody to be "shut off" more than two or three days at a time,

while during the nights and Sundays, everyone is at liberty to take as much water as he pleases as long as there is any in the ditch.

The field to be irrigated is cut up into long, narrow beds with little ridges of earth six or eight inches high all around; the water is then let in from the ditch at the end of the bed, and is permitted to run into one after another till it covers the whole ground to the depth of from two to four inches, some crops requiring more than others, and then, with the bright, warm sunshine that prevails, especially in the Rio Grande valley all day and every day throughout the summer, everything grows with a luxuriance that would astonish a farmer from the "rain belt." The crops are raised from the same land nearly every year. Oats may be put in during the latter part of February and cut in May; corn is then put on the same land and has plenty of time to mature before frost.

The principal disadvantage of irrigation is in the fact that it prevents a man from carrying on the business of farming on a very large scale, if that is, indeed, a disadvantage, and it is not probable that there will ever be any ten-thousand-acre farms worked in this way, but experience has fully established the fact that the "little farm well tilled" is better for the individual as well as for the community.

Irrigation makes more labor in some directions, but this is offset by the labor saved in other lines; for instance, the farmer is spared the work of fighting weeds at the roadside, in the lanes and walks and fence corners, because where no water is applied there can be but little, if any, growth. But the most important advantage of all is in the fact that much more can be produced by irrigation than without on a given area, and that there is an absolute certainty of good crops all the time; not two years

out of five but every year. The best and most practical illustration that could be given of the results of irrigation may be found in the Rio Grande valley for twenty miles on either side of Albuquerque. The most of the land in the district named is too valuable to be given to grain growing, but is devoted mainly to gardens, orchards and vineyards whose products cannot be surpassed in quantity or quality by those of any other quarter of the world, and they depend solely upon the ditch for their water.

WANT OF CARE.

At first farm drainage was, in some respects, a failure on account of using tile that were too small and having them imperfectly laid. The farmers are now digging them up and putting in larger tile and laying them with the use of a level. One of our best and most intelligent farmers will not have a tile laid until a survey is made and the levels taken by a competent man. Farmers are also putting branches or streams of considerable size underground into tile; streams that it was once thought impossible to bury in this way. A stream near our factory has been tiled in this way and the land produced 100 bushels of corn per acre the first year after being ditched, which paid the expense of ditching and a fair profit besides. Large ditches are cut from four to five feet deep thus preparing a large body of earth to absorb the water as it falls. A shallow ditch would not take the water so rapidly. Our tile are all sold of last year's make at fair prices. We make both brick and tile.—O. D. LAND, Johnson County, Ind.

UNDERDRAINAGE, if well done with drain tile, is a permanent improvement—to last for centuries, so that we can well afford to do the work well.

Farm Drainage.



PRACTICAL ADVICE.

Next to perfect grading of the bottom, the effectiveness and permanency of the whole draining operation depends on the careful laying of the tiles. The work should never be intrusted to a raw hand, unless the latter is endowed with an unusual amount of common sense, skill and intelligence. It is not safe to run the least risk of having this important work slighted. Following are instructions given by T. Greiner in the work just published by William Henry Maule, entitled "How to Make the Garden Pay:"

Laying the tile should follow immediately upon the leveling (grading) of the bottom, and in order to perform this task without stepping into the ditch a six foot pole with a one-quarter inch iron rod fastened to the end and bent in the form of an elbow is used to handle section after section of tile, and placing it in its proper place. The ends should be closely fitted together, and clay subsoil firmly packed around them to hold them in their place, until the ditches can be filled up again to the top. Fine surface soil or anything that will

decay should not be put immediately in contact with the tiles. It is also essential that the point of discharge in the laterals should be a few inches above the level of the main, to insure a good flow. It is obvious that the tiles can be laid directly upon the bottom of the ditch when the subsoil is perfectly hard and solid, especially if of stiff clay. Soft muck or quicksand in the bottom of drains makes it necessary to rest the tiles upon a line of narrow six inch boards placed in the drain.

In some instances tile cannot be readily obtained, at least not without paying heavy transportation expenses, and other means of constructing the drain have to be found. I have used board troughs with excellent results. The poorest kind of lumber may be utilized for this purpose. Two boards are nailed together at right angles and held firmly in place by strips nailed diagonally across. Such troughs may be placed directly upon a carefully graded, hard, stiff clay bottom, or upon a line of boards placed upon soft bottom in same way as the tile. Stones and pebbles, where plentiful can be used to good advantage also; but to get a properly constructed drain with such material the inexperienced owner will always find it safest and cheapest to have the work done by somebody that understands it. Tile is always best, and drains thus made will be of more lasting value. All stone drains are quite liable to get choked up after awhile, since it is almost impossible to keep the soil from washing and working among the stones, and finally fill up the throat.—*Ex.*

BARNYARD DRAINAGE.

There is nothing like having a barnyard drained. A common kind of a side hill is good, but if you can put the barn on the bank of a creek, the arrangement is very complete indeed. The

noxious juices, the essence of the whole business, will pass off the premises neatly and expeditiously, without any particular effort on the part of the owner. That which is left will be nicely bleached and drained out instead of being saturated through and through with a lot of nasty, yellow settlings. It will do a man's heart good, that is, a man who has his barn in such a location—to see the stained flood trickling off his side hill after every heavy rain, and during the spring freshets, down across his neighbor's meadows, leaving his own yards nice and dry. He has the satisfaction, too, of knowing that he won't have half as much weight to haul out into his fields that he would have if he had not such excellent drainage. A vast amount of labor is thus lifted off his hands, and he will not have to deny himself the social pleasures that arise from frequent and prolonged visits to the grocery and saloon.

But seriously, I wonder if the readers have ever considered how much is lost in this way. In their efforts to get a dry location for the barns and yards, thousands choose just such locations as I have described. Thousands of others select locations that are not quite so noticeable, and where the drainage is not quite so direct, but which results in nearly if not quite as much loss. To be sure it is desirable to have the yard dry, or at least navigable in wet times, and an elevated location offers the readiest means for this purpose, but any sensible man who stops to think about the matter at all, must realize what the result will be.

Still there is no need of having our barnyards sloppy and wet over half the time, as many yards are, where the owners have been obliged or have chosen to put them on level ground. Barnyards may be drained of surplus water, and that, too, without drawing any of the in-

gredients of the deposits. Surface drainage will not do this, however, any more than it will drain a field without carrying off a good share of the fertility of the field. Underdrainage is the scheme. In that way the soil acts as a filter, retaining all that is of any value, and letting off the water in the pipes that lie way below the filtering apparatus.—*W. D. Boynton, in Wisconsin Agriculturist*

Correspondence.

Filling in Tile Ditches.

Editor Drainage Journal:

When we commenced putting in tile we thought to fill up the ditches after the old prescribed rule, by using a long double-tree with a horse on each side of the ditch.

We found this unsatisfactory, as it took two drivers, or else the horses must be checked or jockeyed apart. Then it required considerable skill to drive properly, for one or both of a team of horses are usually foolish about working near a ditch, hence we discarded the long double-tree entirely. We usually drain sod land during the winter, that is, to be plowed the next spring. When the tile is laid, we cover about six inches by cutting clay off the sides of the ditch, directly above the tile. This is easily and quickly done while the soil is fresh, that is, soon after the ditch is cut. With this covering we leave the ditches till plowing time; often by that time the forces of nature by rain and frost have filled the ditches one-third to one-half full. When ready to fill in we do it with one horse and plow, setting the clevis on beam to one side to throw plow as near the ditch as possible. Usually there is one horse on the farm that will walk as near the edge of the ditch as necessary. We plow in with

one horse till the ditch is nearly even full, then attach two with common double-tree and finish the job. It is hard work on the one horse, but there is no need of continuing the work till the horse is exhausted. It takes but a few moments to change the plow for the work, and can be done once a day as the plowing advances on the drain, and with much less trouble than to be bothered with the long double-tree and its attachments.

In cutting our drains we throw the top spade to one side, the clay subsoil on the other. In filling in we put the latter in first. The draft on the horse will be very much lessened if the cuttings have slacked and dried out before they are plowed in. If this work is done when the soil is wet and heavy it leaves a line of the meanest kind of clods along the course of the drain.

Roxabel, Ohio. JOHN M. JAMISON.

A New Fruit Country.

Editor Drainage Journal:

A few notes from this place may interest some of your many readers. We have here one of the richest valleys in the world. It is 30 to 40 miles wide, 300 miles long and as level as a floor. The Pecos River, which flows through the valley, carries a bounteous supply of water and is fed by hundreds of living springs from its source to its mouth.

An extensive system of irrigating canals is now in course of building, 120 miles of which are already completed. Over 400,000 acres of rich lands have been reclaimed by these canals, at least 20 per cent. of which are still in the hands of the Government, subject to entry under the homestead laws.

A railway has lately been built into the valley, so that farmers now have a direct outlet for their products. We have the same climatic and soil condi-

tions as exist in Southern California; and being 1,000 miles nearer to the Eastern markets, this valley is destined to become, in the near future, as rich a fruit country as any portion of that State.

I shall be glad to give additional information to anyone who may desire it.

G. O. SHIELDS.

Eddy, N. M., April 30, 1891.

In Reply.

Editor Drainage Journal:

The inference of Mr. Kochtitzky that I had not visited New Madrid or studied the topographical survey of the Mississippi Valley from Cairo to Memphis, is well drawn. When writing my contribution to the JOURNAL it occurred to me that the New Madrid earthquake of 1811 might have had something to do with the conformation of the surroundings. I searched my books for the source of my information. In Page's Geology, page 255, speaking of the changes wrought by earthquakes, I read: "So, also with the Valley of the Mississippi in 1811, which, from the village of New Madrid to the mouth of the Ohio River was convulsed to such a degree as to create *lakes and islands*."

It was not Page's History of the Madrid Earthquake I read. Failing to find it I wrote from memory. I did not overdraw the original. The history says: "The greatest shock was experienced after night. Lights shown brightly in village and upon river boats. The earth is convulsed. The boats are dashed by mighty waves as in storms at sea. Morning comes. New Madrid is not."

Mr. K. says the topographical evidence is *absolute* that the Mississippi River has never had its channel in the western half of the valley. May not this be true and may it not also be true that the earthquake of 1811 had much to do

with the present conformation of the valley? I fail to see why the theory of the raising of a river's banks by its overflow should not hold good in the Mississippi as well as in smaller streams, unless it is that a giant does less work than a pigmy.

Who can say that the valley of the St. Francois was not founded—depressed during this struggle of the world-building gods?

Sir Isaac Newton said he could poise the world if he had something exterior to it upon which to stand his fulcrum and lever. Mr. K., no doubt, could detect those little seismic disturbances in the valley if he had an exterior stand for his transit level and bench mark.

Will Mr. K. be so kind as to tell us through the JOURNAL about that drainage work upon which he is employed?

THE EARTH'S FORMATION.

I hope no reader of the JOURNAL will be harmed by what I here pen, though the subject may be foreign to its object and spirit. Mr. Otto Kochtitzky says, in his strictures upon my paper in the April number of the JOURNAL, that the valley of the Mississippi at Cairo and below, is filled with a deep sub-strata of sand 100 to 300 feet deep, evidently placed there before the Mississippi ran through it (the valley) *as a river*, and while it was yet an arm of the Gulf of Mexico. Is it true that the Mississippi did not run through its valley *as a river* anterior to the deposition of this sand? Let us see. The earth born of the sun in the youth of the solar system, had for its natal gown, a swaddling of fire. By parting with heat to surroundings it cooled down. In process of time by giving off heat a crust solidified upon its surface. This contraction by parting with heat is ever going on. This contraction shortens circumferences, diameters, radii and chords. The arch of the

crust, being only about eight inches curve to the mile, is too flat to support the weight of crust and hence it follows up and rests upon the ever contracting molten part within. This the crust cannot do without crushing or buckling. Hence our hills, valleys and mountain ranges. During the Silurian age the Silurian Sea, Atlantis, rolled unbroken from the Atlantic Ocean to the Rocky Mountains. About this time, by the contraction above referred to, the stress was so intensified, that to get relief the crust had to buckle. Then began the folding (extending through thousands of years), or upheaval of the Cincinnati Anticlinal, from south line of Tennessee to Canada Highlands. The raising of this mighty arch did not give the needed relief and a buckling on a grand scale upon the line of the Appalachian or Allegheny chain of mountains gave relief. Coinciding astronomical causes some 200,000 years ago, more or less, increased the ellipticity of the earth's orbit and brought the earth to the winter solstice at her Aphelion passage. The land in relation to water surface rose. The Silurian Sea withdraws, cold intensifies, glaciers mighty cover the land as far south as Cincinnati. The great lakes are scooped and the excavated material scattered broadcast. The southerly protruding tongues of these glaciers melt away, sending ocean gushes of water adown the Mississippi valley and its tributaries, which ran then upon beds of rock and extended on out in the Gulf, as the submerged ancient beds of the Potomac, Susquehanna, James, and other rivers flowing into the Atlantic Ocean show. The ever change producing astronomical forces working out the destiny of our plant with allies terrestrial are at the helm. The land in relation to the water surface again slowly but surely subsides, is again invaded by an

incoming sea. The land, river valleys, all pass beneath the sea. The geological cycle is completed. The land again emerges dripping from its ocean bath; creeks and rivers begin the work of soaking and clearing out their old channels, which work is going on to-day while they flow far above their ancient rocky beds. *When was the sand* in question thrown down?

In the above geological summary the writer may have turned two or more leaves at once, or skipped a paragraph or two.

J. ARNETT.

London, Madison Co., O.

The County Should Help.

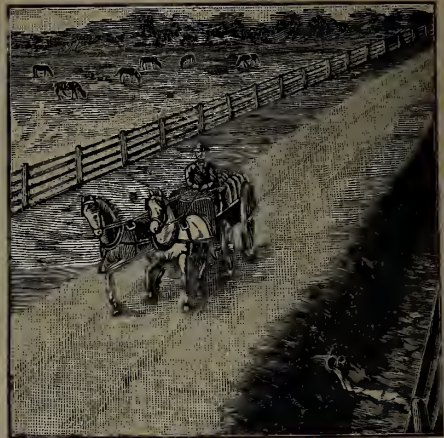
Editor Drainage Journal:

I read with much interest your piece in the JOURNAL upon the Improvement of Highways. When I read it I wondered whether you had plenty of gravel in your state and if so, was it well distributed over the country. In this Co. (Madison), we have plenty of gravel—a little scarce in places—and we have improved about 500 miles.

I think our law ought to have been so framed as to make the county contribute a fourth or a third toward the cost of each improvement. If you have plenty of gravel, the improvement of your roads is without a drawback. If you are without the gravel, then the writer is at a loss to know how you will bring about the desired end. The impression I received from a committeeman sent to me about fifteen years ago from your state to learn of me our method of improving roads was that gravel was scarce. I do not know how my name or business had become known to the people of this committeeman unless one of my circulars advertising a road improvement letting, had drifted among them. I confess the impression made upon my mind is gloomy still as to the outlook for good roads in his section.

J. ARNETT.

Road Drainage.



PUBLIC HIGHWAYS.

One of the best investments a community can make is the judicious expenditure of public funds for the improvement of its highways. But before another cent of money is added to the road tax, there should be a sweeping reform in the methods of improving the roads. Under the methods generally in vogue there is an enormous waste of money and labor. Under reform methods that are possible, the same amount of road tax would do so much good that the people would be willing to have it increased. If they received the worth of their money they would not object to the amount of the tax.

Dr. Collier, of the New York Experiment Station, in an address to farmers on the improvement of highways, said:

"It seems to me that it should be for the future 'the pet scheme' of every man, and of every woman and child also, until some action shall be taken looking to their permanent improvement. Within a week I had the pleasure of riding over a stretch of macadamized road nine miles in length, which within two years

has been laid in one of the New England States, and I could not but think that such a road, like a thing of beauty, was a joy forever. Consider for a moment the enormous tax which our roads involve, without considering even the millions upon millions of dollars, which, during the past half century, have been expended upon our roads without at present any evidence of improvement in their condition; consider the wear and tear of horses, harness and vehicles which the condition of our roads for months in the year involves; consider the loss of time, which also is money, and the wear and tear upon one's patience, for I doubt whether grace has been given to any sufficient to sustain him for a ten-mile drive over any of our roads during several months of the year."

Public interest in this subject is increasing. To add to this interest and draw forth some valuable suggestions, prizes are offered for the best essays on the improvement of highways. The following explains itself:

"Under the auspices of the American Economic Association, Colonel Albert A. Pope, of Boston, offers \$500 in two amounts, of \$300 and \$200 respectively, for the first and second best essay on "Country Roads and City Streets." The essay must not exceed 25,000 words, and should treat of the economic and social importance of good roads, the causes of poor roads existing in much of our country, the best systems of roadmaking, reconstruction and maintenance, including cheaper methods suited to dirt roads as well as methods for permanent roadways, the best system of street improvement, the systems of taxation that should be employed in both country and city to distribute justly the burden of road and street improvement, and the legislation that is required to further these ends. Competition is open to all.

Further information may be obtained by addressing Professor Richard T. Ely, Baltimore."—*Ex.*

COST OF REPAIRING.

Whenever a farmers' meeting convenes to talk over the oppression of the railroads, let us insist that their attention also be called to the common highways, and to consider the fact that farmers are losing nearly as much by their own oppression of agricultural interests as by the grinding of corporations. The railroads are giving us great service at a cost so near the minimum figure as to render the smaller roads in competition bankrupt. But were there greater room for complaint against railroads, we are losing annually by wear and tear and delay from unmade dirt roads a vastly greater sum, and one almost beyond the belief of those not interested. The annual cost of repairing county roads is not less than \$25 per mile and, of course, more than that as you approach towns and cities. Take the average at \$25. Is this sum not a total waste? In ten years you have spent over \$250 on each mile of road, and the roadbed is not one whit better than at the start. Meanwhile the wear on wagons and carriages has probably a good deal more than doubled this expense.

"A given load that can just be drawn by one horse on a level iron track will need the power of 1 2-3 on asphalt, and will need 3 1-3 horses on our best granite block pavement, seven horses on good cobble stones, twenty on ordinary earth roads and forty on sandy road." These are the results of actual experiments and they show the enormous value of a good surface on our highways.

One should not be overwise. Integrity is the best mantle.

Agricultural.

CULTIVATING A CROP.

We stir the surface soil an inch or two deep as soon as possible after it is dry enough after each shower. Of course in a wet time, when showers follow each other in quick succession, we do not follow the above rule. But we are very careful not to get caught and let the surface crust over after the last shower. So careful are we in this respect that we often stir the surface only to have it wet down again in a few hours. We had better lose our labor half a dozen times than let the ground dry up and crust over once. My only cultivated crop is potatoes. Moisture is very valuable to them. We can not often afford to let any of this go to waste that we can save by careful and timely cultivation. This matter of sufficient moisture is largely under our control. I have yet to see a season in which we could not grow a good paying crop of potatoes in spite of drought. In fact I believe a half crop can be grown without any rain at all from planting time to digging. It is wonderful what man can do in this line. It is more wonderful, however, that so many pay no attention to this point and quietly accept a total failure, or very nearly so, as their "luck."

There is seldom a year when we have rain enough during the growing season to make a crop of potatoes. The main source of supply is what is stored up in the earth beneath and is constantly being brought up by capillary attraction. The farmer who simply cultivates a certain number of times in a season, without regard to just when, may lose much of this, as well as of what comes directly from the clouds. More intelligence must be put into the work. The surface must be constantly mulched to check

the unnecessary evaporation. An inch or two of freshly-stirred soil is the most practical mulch. Of course we lose a little moisture, after a rain, before the ground is dry enough to allow one to go on it without injury. Aside from this I do not intend to let any water evaporate directly from the soil in my potato field that work can prevent. It must go through the vines on its way up and pay tribute. I speak positively on this point, because I know I have made thousands of dollars by paying attention to it, and I have seen others lose thousands by doing the contrary. In truth I have made the thousands because others were slack. I had something to sell when the crop was a failure and the prices consequently high.

Of course I am not selfish enough to wish for drouthy seasons, but the fact remains that such years like 1881 and 1887 bring me the most money with the least work. How many readers of the *Rural* have contributed to this result? How many will when the next drought comes? My wife sometimes says I might have got rich if I had kept my mouth shut. Alas! farmers are too slow to change old practices and think and study! I am not cutting my own nose off as fast as my wife thinks. Again, the specialist can do this if he will, and this is one of the strong points in favor of special farming; but the "mixed" farmer, with his numerous crops to attend to, *can not*, by any possibility, do all this work when it ought to be done. He will continue to plant potatoes in the spring, and when a bad season comes buy for his own use in the fall, of the specialist. I have sold thousands of bushels to such men.

I am writing of ordinary farming land in my latitude. Very rich land and a location further north will make a difference. For example, my friend J. M.

Smith, of Green Bay, Wis., the noted gardener, who uses forty to fifty loads of manure to the acre, every year, raises larger crops of potatoes than I can and does not cultivate one-half as much. Readers should bear in mind that all this cultivation that we give (I would hardly dare tell how many times we go over the ground some years) is shallow, after the very first time. An inch and a half of freshly stirred soil makes a mulch that pretty thoroughly checks evaporation and does not injure the roots. Such cultivation need not stop when the potatoes are in blossom. It can never do any harm as long as the horse can get through between the rows, and it may do much good.

I might go back further and say that I try to check unnecessary evaporation from the very moment the clover sod is turned over. If at all dry, we harrow at once, to keep the land from drying out. If there comes a rain, we harrow again at once. When we were part through planting this spring, a light shower came, not enough to prevent our planting the next morning; but we did not, but hitched on to the harrows and stirred all the field first, that which was planted and what was not. Last spring we would not have taken this precaution, as we were getting rain almost constantly. This spring the weather is quite dry, with strong indications of a long spring drought. Let it come; I am ready for it. Every move has been made with this end in view for the last month. I put twice the tillage on my land before planting that I did last year. With fine, firm soil, and the surface lightly stirred (and the soil full of clover roots), I have done my part; as an old friend of mine says, "divided fairly with Providence."

We have just finished planting by hand one and three-quarters acres with very valuable seed (\$3 a pound). The

Cutaway harrow went over the land four times, and the Thomas about as often, and the roller twice. One can hardly overwork dry land. Then I put perfectly fine mellow dirt over each set with a hoe, and then trod on each hill. As soon as we were through we scratched the surface over with Breed's weeder, all with a view to save the unnecessary evaporation of moisture and get a crop, whatever the state of the weather. Some good people will call that irreverent; but God gave man "dominion." It probably displeases Him more to see people so loath to take this great gift and so ready to find fault with the seasons.

After looking this over I would add that we stir the soil again after five to seven days if it has not rained meanwhile. By that time it settles together so as not to make as perfect a mulch as freshly stirred soil.—*T. B. Terry, in Rural New Yorker.*

HOW FERTILITY IS WASTED.

When I see the water in ravines discolored from the drainage from the corrals which border them, I believe somebody is paying dearly for his improvidence and laziness. There may have been some excuse for first settlers locating their feeding yards in sheltered places along the streams, but this practice ought to have been abandoned by farmers long ago. Of course such yards are cleared of manure free of expense to the owners, but this incurs a great loss which many do not count. The corrals should be removed from the ravines and placed on high ground. In this way all drainage from them will be of direct benefit to the land. If such places are necessarily bleak, shelter should be erected; if unable to build barns and substantial stables, put up walls and temporary shelters. Keep your stock confined to the yards and stables as much as possi-

ble and bed them well with straw or refuse from the hay stacks. Permit no prairie hay to remain in the field because useless for feeding. Haul it into the yard to increase the size and value of the manure heap. My experience as a farmer tells me that manure made and kept under shelter is worth double that made in the open yard, exposed to drenching rains, which take away its most valuable elements.—*Thomas Buckman, Wyandotte Co., Kan.*

DEPTH OF GOOD SOIL.

The opinions of farmers differ, though not more widely than the facts on which they are based, as to the depth that soil may be profitably cultivated. In the best soils plant food is found deeper than the plow can ever go. This, however, is mainly mineral. Vegetable matter collect near the surface. If they are deep, as they sometimes are, the lower portions are generally filled with stagnant water. Some settlers on black muck soil in the West thought they had secured land of inexhaustible fertility, mainly because it was black to a great depth. They found after a while that, however deep their muck beds, only the part that could be thoroughly dried during the growing season was of any use to them. What such lands needs most is thorough drainage. As soon as it gets this, however, the muck bed becomes thinner, as its carbon burns by exposure to sun and air. Then comes the severest test. If the original soil is deficient in mineral plant food the lacking elements must soon be supplied. But whether poor or rich in mineral plant food, supplies of potash and phosphate will be needed. However poor the vegetable matter may be, its decomposition will liberate ammonia enough to go a long ways toward supplying grain crops, provided phosphate is fur-

nished. But whenever the subsoil is sandy, potash is also probably needed. Wood ashes are nearly always beneficial to muck lands, as the caustic potash they contain hastens decomposition of vegetable food, besides making phosphate also more available.—*Correspondent New York Tribune.*

STRAWBERRIES.

How To Set Them.

By this method two, and even three, crops of berries can be gathered before turning the plants under, and again will be unable to determine which crop is the best. In setting out a new bed, make check-rows four feet apart, and plant at the intersection of the rows; cultivate both ways; keep the runners off until June or early July; then allow sufficient runners to form plants to fill all the space in rows (one way), thus making continuous rows of plants, with rows four feet apart. The advantages of this method are—only about one half the number of plants are needed in the start; greater ease in cultivating, no hard labor being necessary; the plants establish themselves much better than transplanted plants can possibly be made to do. The berries can be picked from plants in single row with less trouble, and no injury to unripe berries; the berries will be larger, better flavored and colored. I had Crescents this year that puzzled good judges to name, being so much larger and better than they had ever seen before.

The widespread interest that has been awakened will cause thousands of "patches" to be planted next spring, and will do much to solve the problem, how to make the farm pay; but there will be much disappointment also. Berries from neglected beds (small, sour, miserable things) will be taken to market; their owners, expecting to get three or

four dollars per bushel for them, will not realize one-fourth that amount—in many instances, nothing at all. Unless you are willing to give them close attention, keep the ground stirred and all weeds out, better let the strawberry business alone. Nothing pays as well for care and tillage, and nothing suffers more from neglect, than strawberries. The man I wrote about last year, who made such a success with berries, scored almost a complete failure this year from the inroads made by the white grubs. He told me, a few days since, that by changing his fields, and the liberal use of unleached wood ashes, he has now the finest prospects in his experience.—*B. in Country Gentleman.*

TIMELY WORDS.

"In these days the farmer has many grievances of which he did not know a generation ago. The newspapers and the stump speakers tell us of the farmers' wrongs, and from time to time huge alliances are formed to set them right. I go back to the old farm in New York on which I was born, the farm my father won from the forest and on which he lived in freedom and independence; knowing no master, dreading no oppression. I find on that farm to-day tenants who hardly make a living. I go over the farm. I see unpruned fruit trees, wasted forest trees, farm implements rusting in the rain and sun, falling gates, broken wagons, evidences of wasted time and unthrifty labor. I wonder whether the oppression of the farmer is the fault of the times or the fault of the man. *If a farmer spend a day in the harvest time in efforts to send a fool to the Legislature or a knave to Congress should he complain if the laws the fools and knaves make should add to his own taxes? If he stand all day in the public square spell-bound by a tramp with an accord-

ion, or, still worse, if he lounges about on the sawdust floor of a saloon, talking the vile stuff we agree to call politics, never reading a book, never thinking a thought above the level of the sawdust floor, need he be surprised if his opinions do not meet with respect? I can well remember the time when the farmer was a busy man. There is many a farm to-day on which he is still busy. It does not take a close observer to recognize these farms. You can tell them as far as you can see. Their owners are in alliance with the forces of nature. The gods are on their side and they need no help from politicians. Their butter sells for money, their oats are clean, their horses are in demand; whatever they touch is genuine and prosperous. The cattle call the farmer up at dawn; the clover needs him in the morning; the apples and potatoes in the afternoon; the corn must be husked at night. A busy man the old-time farmer was; and, being busy, he found time for everything. He read bound books; he enjoyed the pleasures of travel; he educated his family; he kept intelligent watch on all the affairs of the day. He did not find time to stand on the station steps in the middle of the afternoon, to watch a the trains go by on a thousand consecutive days. He carried no handicap load of tobacco and whisky. He went to the county-seat when he had business there. He went with clean clothes, and came back with a clean conscience. He had not time to spend each seventh day on the court-house square, talking the dregs of scandal and politics with men whose highest civic conception is balanced by a two-dollar bill, nor had he time to waste on nostrum venders or vagrants with accordions.

I hear the farmers complaining to-day of high taxes, but no duty on iron was ever so great as the tax he pays who

leaves his mowing machine unsheltered in the storm. The tax on land is high, but he pays a higher tax who leaves his meadows to grow up to white-weed and thistles. The tax for good roads is high, but a higher toll is paid by the farmer who goes each week to town in mud knee-deep to his horses. There is a high tax on personal property, but it is not so high as the tax on time which is paid by the man who spends his Saturdays loitering about the village streets. All the farmer's income arises from the wise use of his time. One-sixth of his time means one-sixth of his income. If he has learned to make use of his time, all other ills will cure themselves.

* * * * *

"I know a thrifty farmer who pays 25 cents a day less to those of his hands who work in the field nearest the railroad. This he does because these workmen stop whenever the trains go by, and so they lose one-sixth of their working time. This is equally true of men who work for themselves. I know a hundred farmers who lose regularly one-sixth of their time by needless visits to the county-seat, and in making these visits needlessly long. One-sixth of their time means one-sixth of their income, or else their whole time is not worth the saving. It is this sixth which represents the difference between poverty and prosperity. If this wasted sixth were saved by every farmer in Indiana our State would be an industrial paradise. To have lived in Indiana would be an education of itself. People around come from the ends of the earth to see the land which has solved the labor question. But it may be their own valuation is a just one. Perhaps there are some farmers whose time has no economic value. There are such in every community—the idiot, the insane, the criminal. For these great hospitals are maintained, be-

cause they can be more cheaply supported in public lodgings at common cost. Shall we add the farmer to this list? Why not have a great State hospital for all men with valueless time; a great square court-yard, covered with sawdust, with comfortable dry-goods boxes, where they might sit for the whole day, and the whole year, talking politics to the music of the hand-organ, watching the trains go by. The rest of the world could then go on with the world's work with some addition, no doubt, to the taxes, but with the corresponding gain in having the streets open, the saloons closed, the demagogue silenced, and the pastures free from weeds and thistles.

"The frost is a great economic agent as a spur to human activity. I know a land where the frost never comes and where not one-sixth, but six-sixths of every man's time is devoted to any purpose rather than that of attending to his own affairs. It is nature's great hospital for the incurably lazy. The motto of Mexico summed up in one word—*manana*—to-morrow. To-morrow let us do it, we must eat and sleep to-day. "*Manana por la manana*" one hears over and over again at every suggestion involving the slightest effort. It is too warm to-day, the sunshine is too bright, the shade too pleasant. "*Manana*," let it be. This is the land where nothing is ever done. Why should we do things when to rest and not to do is so much pleasanter? There is the endless succession of to-morrows. They have come on us since eternity, and surely they will continue to come. Let us rest in the shade and wait for the next to-morrow."

[The above is an extract from the closing address of Doctor Jordan, the late President of the Indiana State University. There is food for thought in the reading of such searching words. Many of the wrongs we experience in life are of our own making, or, in our failing to improve the time.—ED.]

Tilemaking.



THE KILN.

We have some very excellent kilns advertised in the *JOURNAL*, kilns that are giving satisfaction, but we cannot say that a particular kiln will be best for A and another kiln for B, or name any kiln as our favorite, or that is perfection.

We know that much depends on the man that operates it, on the fuel, on the clay, and, last though not least, the method of building the kiln. There are men, at least we have known a few, to purchase the right to build a kiln, and then conclude that they could improve on the method of construction, and, in undertaking to do so, spoil the kiln, to an extent that it did not give satisfaction, and then blame the men who patented the kiln. They do not seem to think that what they did in the way of a change has anything to do with the failure in whole or in part. If the kiln should work well notwithstanding the change, then they conclude that the change they made is the redeeming feature of the kiln.

So we never advise the use of a particular kiln; if we did we might run on a snag, and we would not if we could, for the reason that we are always assured that those advertising in our columns are reliable men—men who do not intend to deceive, and who are entitled to fair play alike.

Then pay your money and take your choice. But we do advise you to follow the plans and specifications in building and after the kiln is built learn how to use it before your final decision is made up as to its merit.

If you succeed from the start you are lucky. If you learn how to succeed after repeated effort, you are to be commended for your persistence and good judgment.

MAKE PLENTY OF TILE.

The manufacturers of drain tile are frequently in doubt as to the advisability of continuing to pile up a large amount of tile when the trade is a little off, or slack, during the busy season with farmers. If there is a general need of drain tile in the country surrounding the factory and the people are alive to the benefits to be derived from underdrainage, there is little danger of making too many tile. There will come a time when the demand will take them. So have faith and go ahead. We have been told and written to by tilemakers to the effect that they made a mistake last season in not making more tile; that they could not supply the demand the early part of this season. One manufacturer said that he could have sold 150,000 more tile if he had had them this spring.

The abundant harvest and the probable demand for our products will make this a prosperous year, unless some unforeseen trouble arises. With general prosperity there will be an increased demand for tile. It will be advisable

this season to have, at the close of the year, a large supply on hand. Prices are generally pretty well maintained and the business at large is becoming each year, more and more, a safe business undertaking.

MAKE A FEW BRICK.

If you have a brick die, and, if not, you can get one at a comparatively small cost, take the time during the season to turn out a few well made brick. If the supply of brick in the neighborhood is a little short the brick will sell for a good price. Burn them in your tile kiln if you have no other provision for burning them.

In some localities the making of a few thousand brick will prove very profitable. There are localities where the demand for tile is limited as yet, where the combining of brick and tile making will be advisable.

NOTES FROM THE FIELD.

We have had more success this year in selling tile than in any previous year. The roads are so bad that farmers cannot haul them now.—R. Howell, Mo.

We have ordered H. Brewer & Co's No. 6 Tile Mill and expect to commence making tile soon. There has been no tile made in this county yet.. Land sells here from \$150 to \$250 per acre. We retail brick at \$10 per thousand, pay hands \$1.50 per day and \$2.50 per cord for wood. We have obtained a great deal of useful information from the JOURNAL. It is a very welcome visitor. —James Thompson, Humbolt Co., Cal.

The Vincennes Brick and Tile Co., Vincennes, Ind., have purchased a Maxfield Crusher, Disintegrator and Stone Separator to crush their lumpy clay, and are well pleased with it.

AMONG MACHINE MANUFACTURERS.

At Decatur, Ill., the Decatur Leader Manufacturing Company have erected brick buildings on the old grounds of the Decatur Brick and Tile Co.

It will be remembered by our readers that in a recent issue of the JOURNAL we made mention of the Brown and Frazier Co., of Portland, Ind., merging into the organization of the Decatur-Leader Mfg. Co., and the removal of the works from Portland, Ind., to Decatur, Ill.

Both Messrs. Brown and Frazier are made principals in the new company and they bring with them their experienced workman to their new works.

The new works are amply provided for in buildings and equipments. They began operating them on the eighth day of June, with orders enough on hand to employ a full force of men.

The Leader Brick and Tile Mill has earned a reputation that gives promise of a large demand for this Mill alone, besides the company will manufacture a full line of Clayworking Machinery.

The new company is organized with \$50,000 capital, and the amount can be doubled if the trade demands it, as it probably will in the near future. Some of the wealthy citizens of Decatur have taken stock in the enterprise, the Decatur Brick and Tile Co. being a large stockholder in the new company. The outlook for the new organization is very promising, indeed.

THE DECATUR BRICK AND TILE CO. have purchased a site on the line of the Wabash Railroad, a half mile distant from their old works, and are erecting a model plant for making both brick and tile. They have put in a ten tunnel Sharer Dryer, the tunnels being 100 feet long. The Dryer proves to be very satisfactory. They have also built four kilns with a capacity of 80,000 brick each.

—Mr. J. G. Shea, the Superintendent of the Company's works, and who has succeeded so admirably in the conduct of the business, has brought into requisition his past experience in the erection of the new works. As soon as it is convenient to do so, the entire business of making tile and brick will be transferred from the old site to the new.

The Company have a contract for over a million paving brick to be delivered to Evansville, Ind., and contracts at other points. The city of Decatur will require a million or two this season.

THE ADRIAN BRICK & TILE MACHINE CO.,
ADRIAN, MICH.

This Company have large and commodious works. We found them busy. Their trade was never so good before, as this year. They find it difficult to supply the demand. The paving brick interest has drawn heavily upon them for machinery. They have put in some large plants during the season, so far, and have contracts ahead sufficient to insure a very busy future.

The Automatic Brick Cut-off manufactured by this Company is commending itself to the trade. We saw it operate and it certainly does the work without a skip, so far as we can see.

Mr. J. C. McKenzie, of this firm, is a practical brick and tile maker of many years' experience. He has quite extensive works near by the machine works. His experience in this line has added much to the practical working and efficiency of the many devices in Clayworking Machinery that have been perfected under his supervision by the Company. He knows what is needed and when the needs are supplied, which goes a long ways in the manufacture of machinery.

KELLS & SONS, ADRIAN, MICH.

We find them pressed with orders. This is a conservative firm—quiet but

persistent. Much of the labor is performed by the members of the Company. They are careful, painstaking and jealous of their reputation for faithful workmanship. They work on in the even tenor of their way; if the demand does not take all that they can make they go on making, believing the harvest will come by and by, and it does. At other times we have visited their works when they had a large supply ahead, but not so this time—the demand has left nothing behind except as it is turned out daily. "Very satisfactory, indeed," is what they said, when we asked them "How is the trade?" We don't make much fuss about it, but our machines give satisfaction and the people pay for them without any trouble. We advertise in the DRAINAGE JOURNAL and two other papers and that is all, and we have all the trade that we can well take care of."

MICHIGAN BRICK & TILE MACHINE CO.,
MORENCI, MICH.

This Company has been reorganized with increased capital, and since our visit of two years ago have added to their machinery until they are well equipped for the business. The proprietors assure us that no pains is spared to increase the efficiency and durability of their Clayworking Machinery. In the many years of experience in the manufacture and use of clayworking machinery, (for they have a large brick and tile plant of their own) they feel assured that they can meet the demands of the trade in the fullest sense, as to real merit.

They report an excellent trade thus far this season, are a little behind on orders, and have orders for future delivery that will keep them rushing. They say the outlook of the business is very promising, indeed.

Mr. Clark, the President of the Company says: "This is a big country of ours

—demand for machinery springs up where we do not expect it, and we have to hustle to keep up with the times.”

TECUMSEH, MICH.

This is a pleasant town in Southern Michigan, twelve miles distant from Adrian. We have always felt when visiting this place that we would enjoy living here. The streets are clean, the grounds about the resident property are well kept and withal there is an air of tidiness and thrift that speaks well for the place. Here is located one of the oldest machine works engaged in the manufacture of Clayworking Machinery,

H. BREWER & CO.,

This Company is well known to our readers, for the extent and excellence of their machinery.

“How is your trade?”

“The best we ever had; have lost some orders because we could not fill them as soon as they were needed. We have had a large trade in the South on brick machines. We have enlarged our works and have increased our capacity as far as possible, by putting in the best machinery to be had, and now it looks as if though we would have to build a large addition to our works to give us the much needed room, and we are planning to do so. Our machinery was never better received than it is to-day. We are improving and adding to its strength and efficiency as the use and wear may indicate. The past ten years has witnessed a big advance in clayworking machinery, as you quite well know. It has been our aim to make the best machinery and give satisfaction to our trade, and the result has been very satisfactory to us.”

“The future outlook for trade is very promising, indeed,” is the way they talk.

TIFFANY IRON WORKS, TECUMSEH, MICH.

Here are large commodious buildings, with new tools of the latest and most

approved patterns. These works were planned by George S. Tiffany, who is well and favorably known to many of our readers. For many years he has devoted his time and talent to the improvement of clayworking machinery, and some valuable inventions in this line have been the product of his brain.

The ample room and arrangement of the new works are such as we should expect friend Tiffany to erect.

The first brick were laid last August, and now the building is teeming with busy life. They have already made a number of sales of machinery, and they say the outlook is good.

Mr. Tiffany said: “It is our purpose to make our machines of the best material and with strength sufficient to bear the most crucial tests.”

There is a massiveness about the construction that impressed us with the opinion that they would meet the wants of the trade. At present they are manufacturing a large size brick and tile machine, crushers, cut-off tables, etc. Their advertisement will be inserted in the August issue of the JOURNAL.

With Mr. Tiffany's years of experience in the manufacture of machinery and in the working of clays, there is an assurance of success.

E. M. FREESE & CO., PLYMOUTH, OHIO.

Here we find them rushed with orders. As is well known to our readers they are the manufacturers of the Ohio Brick and Tile Machine, together with crushers, pug mills, cut-off tables, and other clayworking machinery.

“We have sold eighty-one brick and tile machines, and some of these sales included a full outfit for a plant, all since January 1st of this year,” is Mr. Freese's statement, handing us a book containing a list of sales.

The business has so increased upon their hands that they have arranged to

remove to Galion, Ohio, where they will have better shipping facilities, and where they are erecting large machine shops for their occupancy. From what we learn of the new buildings which are being erected, they will be large and well arranged, affording all the room necessary for the further expansion of their business.

They greatly need more room, and very naturally they look forward with a sense of coming relief when they shall be settled in their new quarters.

The success of this Company in building up so large a trade in a few years, in crowded quarters, is very much to their credit.

"Our machinery is well received, wherever we have introduced it, and the demand is increasing so rapidly, that we are compelled to have increased facilities to supply the trade. Our Automatic Cut-off is a success, giving good satisfaction wherever used."

"The future outlook was never so promising for the sale of clayworking machinery as at the present," is the way this firm talks. And they certainly have good reason to be full of hope for the future of their business.

A NEW FIRM.

J. D. Fate and others, formerly of Fate & Freese, are erecting large brick machine shops for the manufacture of clayworking machinery at Plymouth, Ohio. They will probably be ready for operation in the next sixty days. The works will be fitted up with most approved machinery.

They are experienced men in the business and will no doubt make a success of their undertaking. When ready for the trade they will make it known through the advertising columns of the JOURNAL.

THE FREY-SHECKLER CO., BUCYRUS, O.

We were surprised on arriving in this

city to learn that the above company have enlarged their works to an extent that they now have on their pay roll 125 men. We expected to hear that their trade was good and the outlook promising, but, better still, they are crowded with orders.

This firm gives special attention to the building of large plants for the manufacture of both building and paving brick, as well as supplying tile manufacturers with necessary machinery.

"Our machinery was never better received than to-day. We have put in several large plants recently," they said. And we might have learned much more as to the present and future of the business if we had had time, but the train is due in a few minutes, so we are off for the depot.

Brick and Tile Notes.

Bentonville, Ark., wants a tile factory.

The Belmont Brick & Tile Co., Martin's Ferry, O., has been organized.

A. B. Mayer, Gretna, O., is putting a new tile machine in his factory.

The Mather Brick & Tile Co., is the name of a new company at St. Louis, Minn.

The West Chester Brick & Tile Co. have put in a Henry Martin Stock Brick Machine.

The West Springfield Brick & Tile Co., Springfield, Ill., has been incorporated by Henry Dawson, Jno. L. Mason and Ed. Dawson.

The Decatur Brick & Tile Co. have contracted to pave one of the principal streets in the city of Evansville, Ind., with brick, one mile in length, which will require a million or more of pavers. The freight rate from Decatur to Evansville is \$2.00 per thousand.

The Drainage Journal.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete; you will have use for many things published and the volume complete will make a valuable book

*J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.*

SUBSCRIPTION RATES.

The Drainage Journal (monthly), one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten " " " ".....	8 00
Single Copies.....	10

Send for rates for larger clubs.

TO ADVERTISERS.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile. It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is the best possible medium for those having tile machinery, brick machinery, kilns, fire-brick, engines, ditchers, clays, tile yards or second-hand machines for sale, to advertise in.

ADVERTISING RATES.

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	\$ 150

No advertisement inserted for a less sum than \$1.
 Twelve lines Nonpareil type make one inch.
 Liberal discount for longer time and larger space.
 Transient advertisements must be paid for in advance.
 For large advertisements address the publisher for terms.

DEPARTMENT OF AGRICULTURE
ALBUM.

The Department of Agriculture at Washington has issued an album illustrating the average yield per acre and value of corn, wheat, oats, rye, barley, buckwheat, potatoes, tobacco, cotton and hay, in an outline map of the United States. This is done by the use of colored plates. The difference can be seen at a glance from the color and the exact yield from the figures. These charts or outline maps are prepared from the Census Reports, by J. K. Dodge, the well-known Statistician.

The average yield of corn in Indiana as shown from these Statistical Maps is

28.9 bushels, Illinois 26.7, Iowa 30.9, Ohio 30.9, Nebraska 32.8, Vermont 32.5, and away up in Minnesota 29.6.

The value of the corn product per acre ranges as follows, of the States named: Indiana \$10.84 per acre, Illinois \$9.38, Iowa \$8.63, Ohio \$13.16, Nebraska \$7.58, Vermont \$23.18, Minnesota \$10.86. These averages are taken from a period of ten years.

Wheat in the following States is as follows: Indiana 13.1 bushels per acre, Minnesota 12.5, Michigan 15.2, Illinois 13.4, Ohio 13.6, Kentucky 9.4, Tennessee 6.7, Iowa 10.6, New York 14.7, Massachusetts 16.3, Montana 17.6 and Pennsylvania 12.6. The average yield in value per acre of the States above named is, Minnesota \$9.31, Michigan \$13.40, Indiana \$11.36, Illinois \$11.32, Ohio \$12.42, Kentucky \$8.23, Tennessee \$5.95, Iowa \$7.56, New York \$15.03, Massachusetts \$20.74, Montana \$14.48, Pennsylvania \$12.66.

Each of the products named may be traced through the States and Territories and the yield per acre and the value determined.

This is a very valuable and interesting publication. The Department of Agriculture are to be congratulated for the many valuable publications issued and sent out in the past two years. Farmer Rusk is bringing the department to the front. It is something more than a seed distributing department. We are glad to feel that the interest of agriculture is in the hands of those who feel an interest in its development in all its branches.

THE PROCEEDINGS OF THE NATIONAL BRICK MANUFACTURERS' ASSOCIATION, held in this city January last, is out, making a book of 175 pages, T. A. Randall & Co., of this city, publishers. The membership of the Association are each entitled to a copy free; other parties can

procure a copy by sending 50 cents to T. A. Randall, Corresponding Secretary, Indianapolis, Ind. The proceedings are well worth a reading, and valuable for reference.

There is located at LaFayette, Ind., an institution founded especially for the benefit of the farmers of Indiana. This is at Purdue University, the farmers' college. Here are extensive barns, experimental fields and laboratories, where experiments are conducted, designed to assist the farmer. Animals are fed different foods and under unlike conditions. Field crops, fruits and vegetables are cultivated in various ways, fertilized with manures of different character; animal and plant diseases studied and means sought by which they may be prevented or cured. At least four times a year the station publishes pamphlets containing information of value on these agricultural topics that are free for all who wish to apply for them. If you are a farmer, or are interested in farming and will write to the station to have your name placed on its mailing list, in future you will receive its publications. *Remember they are free* and are printed for the special benefit of the farming class. Send your name and address, with the county plainly written, to the Agricultural Experiment Station, LaFayette, Ind.

THE *Wisconsin Farmer* comes to our exchange table in a new dress and other improvements, well done. But, oh! the head! the head! is in a cloud! a dark cloud! Otherwise we feel to commend the *Wisconsin Farmer*.

The Decatur Leader Manufacturing Co. will change their "ad." in the August number, so as to show the later improvements in their machinery.

Miscellaneous.

The Funny Side Of The World.

BY MARGARET EYTINGE.

I'm sure I'd have long ago ceased to exist,
Or existed with brain rather hazy;
Or, perhaps, been condemned my abode to take up
With those poor souls their friends declare crazy,
For the shadows days and the hours of gloom
I have known far outnumber the sunny;
But this is what saved me—I always could see
The side of the world that is funny.

How to choose the best pathway through life I
have thought

Till my brow I have marked with two creases,
I have built the most beautiful castles in Spain,
And have seen them tumble to pieces;
I've lost friends a-many in various ways;
I have never had half enough money;
But Despair passed me by, for I always could see
The side of the world that is funny.

And I firmly believe that the more we can laugh
The stronger we'll be to face sorrow;
So accept of life's worries the least that you can,
And be sure that you none of them borrow;
And if, looking for sweets, you find only the comb,
From which some one extracts the honey,
You won't mind it a bit if so blessed you can see
The side of the world that is funny.

A cup of water timely brought,
An offered easy chair,
A turning of the window blind,
That all may feel the air;
An early flower bestowed unasked,
A light and cautious tread,
A voice to softest whispers hushed
To spare an aching head—
Oh, things like these, though little things,
The purest love disclose,
As fragrant atoms in the air
Reveal the hidden rose.

Be gentle to the new-laid egg,
For eggs are brittle things;
They cannot fly until they're hatched,
And have a pair of wings.
If once you break the tender shell,
The wrong you can't redress;
The yolk and white will all run out,
And make a dreadful mess.

'Tis but a little while at best
That hens have power to lay;
To-morrow eggs may addled be,
Although quite fresh to-day.
So let the touch be very light
That takes it from the keg;
There is no hand whose cunning skill
Can mend a broken egg.—*Ex.*

JOSH BILLINGS' PHILOSOPHY.

Two enemies to one friend iz about the rite dose tew make a man suckcessful.

Mankind makes most all the ackcidents that happen.

There are but phew men who kan influence others bi precept, but there are none who cannot do it by example.

The only sensible time tew be happy is now. The grate bulk of humanity are going tew be happy week after next.

There iz only one way tew tell the truth, but there iz upwards ov 75 wayz tew tell the same lie.

Epitaffs hav made more people famous than virtew ever haz.

Fashion iz munny invested in clothes.

It iz just az easy tew pull up a weed bi the rutes az it iz to kut it oph; so it iz az eazy tew remove a vice az tew correk it.

A flatterer alwus pretends tew be your friend, and he duz resembel one; but he iz realy no more like one than a hornet iz like a hunny bee.

I have alwuss notissed that thare iz a grate deal ov good luk in industry, and a grate deal ov bad luk in lazyness.

Two-thirds of the pitty in this world iz nothing more than a sekret satisfaks-hun that sumboddy iz wuss oph than we are.

I kno ov people who, when they do yu a favour, do it just az an old bull tarrier lets you pass in front ov his master's door—with a growl.—*N. Y. Weekly.*

—
Holders of First Class Limited single and round trip tickets to Eastern points via the "Big Four" and New York Central routes and permitted to stop off at Niagara Falls ten days.

KIND OF WOMEN MEN WANT.

Grant Allén, that prince of impertinence, says that women, as a rule, like big men. Big in stature, broad and brawney. No matter if they are uncouth, if they swagger in their walk and speak in tones of thunder. "No matter about minds or morals, so they are big and strong and assume an air of tenderness and proprietorship, women fall down and worship them," says a writer in the *Omaha World Herald*. Now, if this is all true, and we would not like to dispute the word of so great a reformer, who no no doubt is a small man and knows what he is talking about—if this is all true, what a fluttering of hearts and quickening of pulses must agitate the fair sex when Sullivan and Kilrain walk abroad, and what objects of envy must the wives of these men be, for are not their husbands the very embodiment of herculean strength—mashers? Ye gods for what taste and appreciation of the male sex does Grant give us credit?

To be sure, women of sense and refinement do sometimes make precious fools of themselves in their choice of husbands, but considering the material they have to pick over it is scarcely to be wondered at. A sensible girl can rarely get a sensible young man. As woman likes to be protected so man likes to protect. And the bright, intelligent girl who can if she must, take care of herself, does not strike his idea of an object to be pitied and protected. What the budding man wants in his youthful imagination, is love in trusting ignorance and sweet simplicity. A little fawning creature, all smiles and tears, who will look up to him with awe, worship him from afar and ask no questions. How often do we see men in middle or advanced age who have climbed up the hill of life from an impecunious boyhood and who

have made their way at last to honor and wealth, sheilding somewhere in the dim background some shrill-tongued, ignorant back number of feminity upon whose existance he does not care to have the light of society to shine too brightly. He has gathered her to his arms in an impulse of careless youth. He has admired her bright eyes and red cheeks, her pert and saucy tongue. She has flattered him by her open admiration, and he imagined he loved her. He knew she had little education and no knowledge of the world, but—education mattered little for women then, and the less they knew about the world the better.

With years he expanded and grew, cultivated all his power of mind and body, and reached an honored place upon the top rounds of the ladder of success.

He has tried to lead her up with him, but—and she was not to blame for it—her mind was too small to comprehend the higher requirements of life—so as he advanced she retreated, or almost—stood still. There was no natural faculties, nor educational foundations upon which to build. Just an ordinary plodding mind linked by mistaken marriage with one of brilliancy and power.

Such a situation is pitiful in the extreme, but is found in more houses than one would imagine in this progressive age. Charles Dickens, great portrayer of human nature as he was, made just this fatal mistake, strange as it may seem, but we read the ignorance of his simple wife was so galling to his sensitive spirit that he could not endure her presence among his visitors, for her blunders in language and manners kept him in a state of humiliation. Yet he married her for love when they were young. No doubt she was good and trustful and obedient. But men tire of being obeyed and of continually playing oak to the

ivy. It sounds nice and romantic in youth—oak and ivy—and men are really more romantic than women. And the frail female who can weep at will—affect and flatters and falls into a man's heart with pretty helplessness—is as captivating to a callow youth as is the sawdust doll to a baby. It doesn't know sawdust from bisk and neither does he.

He believes that women cry because of their tender little hearts, and is thereby assured of their trusting and affectionate nature.

The woman of muscle and brains and backbone has no charms for him. Oh! no. She is mannish, and a mannish woman is an abomination in the sight of the lords of creation. Especially if she grows to ability to take care of herself. He may admire her. He may drink deep droughts of pleasure in the magnetism of her presence and in her intellectual conversation. He may go to her for rest and recreation from the weary routine of business. He may catch glimpses of new worlds of love and life on a higher plane than he has ever dreamed of before. Glimpses of what might have been or what may be—but—to marry—no—he is afraid of her.

Afraid of her superiority, jealous of her intellect, fearful of her knowledge of the world. She could not be deceived. He leaves her with a sigh and a sense of loss, but the meek-eyed Leah is taken to wife, while the brilliant Rachel goes on taking care of herself, or mates with some one beneath her, whom in her heart she will always despise, and when he, at the age of 40, finds out his mistake, who will pity him? There are some reasons why marriage is a failure. Women marry for home, position, protection. Men marry for—heaven only knows what, judging from some matches they make. Servants, perhaps, or pets.

But now and then, blessed thought, the "crescent and silver phantom of the perfect sphere unite their cloven halves of destiny" in the full companionship of equality in love, heart and mind, and these redeem the world.

News & Trade Notes.

Patrons of the "Big Four" will please note that those holding first class tickets running over either the New York Central or West Shore have the privilege of going by steamer from Albany to New York if they desire.

D. A. Poyneer, City Engineer of Dallas, Tex., has invented a walking cane with spirit level attached, a convenience to determine grades, level of lands and for various purposes. If it will keep the head level, we know of men who greatly need such a device.

The Saturday Truth, Churubusco, Ind., of recent date, has an extended notice of J. B. Grawcock's Tile and Brick Works at that place. Speaking of Grawcock's patent kiln the *Truth* says there are over a hundred in use, giving good satisfaction. See advertisement in our advertising department.

Teachers for Toronto take the "Big Four" Route. The Celebrated South-Western Limited, the Special New York and New England Express, and the New Boston Limited are provided with the finest Vestibule Sleepers, Coaches, Cafe and Dining cars. This is the direct route via Niagara Falls and Chautauqua. Teachers tickets good to stop at either place without extra charge.

H. I. Potter, of Leonardsburg, Ohio, claims that the cost of ditching with his machine does not exceed four cents per rod to cut trenches up to the depth of three feet, with smooth graded bottom,

with one man and four horses. Can prove the same by testimony, or is ready to demonstrate by actual work. The cost of making the machine does not exceed the cost of a binder. He would like to put them in the hands of some reliable firm on a royalty. For particulars address H. I. Potter, Leonardsburg, O.

R. C. Burton, Secretary of the Townsend Brick & Constructing Co., Zanesville, O., informs us that that company is using molding sand that is very fine, both in texture and color, and are prepared to furnish it in any desired quantities to brickmakers throughout the country. For prices, etc., address them as above.

Messrs. C. & A. Potts & Co., of Indianapolis, have contracted with Mr. C. T. Doxey, of Anderson, for two complete outfits including two Horizontal Brick Machines, Disintegrators, Sanders, Elevators, Trucks, Barrows, Clay cars and winding drums, one 50 H. P. engine and 65 H. P. Boiler, and 300 feet of 3-inch line shaft.

NIAGARA FALLS EXCURSION!

Thursday, August 6, 1891. via the Lake Erie & Western R. R.---"Natural Gas Route."

On Thursday, August 6, 1891, the Lake Erie & Western R. R. will run their popular annual excursion to Cleveland, Chautauqua Lake, Buffalo and Niagara Falls at following very low rates, viz.:

Peoria.....	\$7.50	Ft. Wayne.....	\$5.00
Bloomington..	7.00	Muncie.....	5.00
La Fayette....	6.00	Connersville..	5.00
Michigan City	6.00	Rushville.....	5.00
Indianapolis..	5.00	New Castle....	5.00
Tipton.....	5.00	Sandusky.....	4.00
Lima.....	4.00	Fremont.....	5.00
Cambridge City, \$5.00.			

With corresponding reduction from intermediate points.

In addition to the above, the purchasers of these tickets will be given the

privilege of special excursion side trips to Lewistown-on-the-Lake, including a steamboat ride on Lake Ontario, for 25 cents. To Toronto and return by Lake from Lewistown, \$1.00; to Thousand Islands, \$5.00. Tickets for the above side trips can be had when purchasing Niagara Falls ticket, or at any time on train.

Besides the above privileges, with that of spending Sunday at the Falls, we will furnish all those who desire a side trip from Brocton Junction to Chautauqua Lake and return **FREE OF CHARGE**.

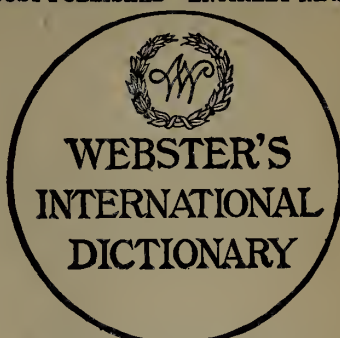
Tickets of admission to places of special interest at or near Niagara Falls, but outside the reservation, including toll over the International Bridge to the Canadian side, elevators to the water's edge at Whirlpool Rapids on the Canadian side, will be offered on train at a reduction from prices charged after reaching the Falls.

Do not miss this opportunity to spend Sunday at Niagara Falls. The excursion train will arrive at Niagara Falls 7.00 A. M. Friday, August 7th and will leave the Falls returning Sunday morning, August 9, at 6 o'clock, stopping at Cleveland Sunday afternoon, giving an opportunity to visit the magnificent monument of the late President Garfield, and many other interesting points.

Tickets will be good, however, to return on regular trains leaving the Falls Saturday, August 8, for those not desiring to remain over. Tickets will also be good returning on all regular trains up to and including Tuesday, August 11, 1891. *Secure your tickets, also Chair and Sleeping Car Accomodations*, early. Those desiring can secure accomodations in these cars while at the Falls. For further information call on any agent Lake Erie & Western R. R., or address C. F. DALY, Gen. Pass. Agent, Indianapolis, Ind.

THE NEW WEBSTER

JUST PUBLISHED—ENTIRELY NEW.



A GRAND INVESTMENT
for the Family, the School, or the Library.
Revision has been in progress for over 10 Years.
More than 100 editorial laborers employed.
\$300,000 expended before first copy was printed.
Critical examination invited. **Get the Best.**
Sold by all Booksellers. Illustrated pamphlet free.
G. & C. MERRIAM & CO., Publishers,
Springfield, Mass., U. S. A.

Caution:—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.



The Pullman Car Line
Between

INDIANAPOLIS AND
CINCINNATI.

The Favorite Line with
Through Dining Car

CHICAGO AND CINCINNATI,
ST. LOUIS AND CINCINNATI.
Best Line to

CINCINNATI, DAYTON, LIMA, TOLEDO, DETROIT AND CANADA.

Through Cars between Decatur, Springfield, Quincy, Keokuk and Cincinnati.

Pullman Sleepers on night and Palace Parlor Cars on day trains.

Direct connection without transfer in Cincinnati for points in Kentucky, Tennessee, Alabama, Florida and the South.

Washington, Philadelphia, New York and the East.

Ask for tickets and see that they read “Via C. H. & D.” on sale everywhere.

H. J. RHEIN, C. H. ADAM,
Gen'l Agent, City Ticket Agent,
Indianapolis, Ind. Indianapolis, Ind.

M. D. WOODFORD, E. O. MCCORMICK,
Pres. and Gen'l Mgr. G. P. and T. A.
Cincinnati, O. Cincinnati, O.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE—TILE

3 to 15 inches at Illinois prices.

GEO. L. PEARCE, Guineys, Va.

WANTED AN EXPERIENCED BURNER

An experienced burner wishing employment will please address
S. J. WOOLLEY,
Columbus, Ohio.

FOR SALE AT A BARGAIN.

Brick and Tile Factory at R. R. crossing. More trade than plant can handle. C. G. COMSTOCK,
Albany, Mo.

FOR SALE.

1 Ohio Tile Machine, size D.
1 Penfield No. 6.
1 Clay Crusher.

Address
J. D. FATE,
Plymouth, Ohio.

FOR SALE.

One Brewer Tile Machine with dies from 3 to 10-inch. One Wallace Clay Crusher. Both machines are complete and almost as good as new. These machines will be sold very low. For price, etc., address,
M. J. LEE,
Crawfordsville, Ind.

BARGAINS

In Second-hand Brick and Tile Machines.
Two Brewer Tiffanies.
One Brewer Elevator.
All in good order. Write for particulars.
DAVIS BROWN,
Portland, Indiana.

FOR SALE.

One Penfield Auger Tile Machine with dies from 3 to 12 inches. One Penfield Crusher with 12-foot elevator. Both machines are complete and almost as good as new. These machines will be sold very low. For prices, etc., address

GEARHARD & DIECKMAN,
New Salem, Rush Co., Ind.

FOR SALE, AN EXCELLENT OUTFIT.

One Ohio Tile Machine in good condition as new—dies from 2½ to 12 inches—a 25 horse-power Engine. and a 30 horse-power Boiler and a Feed Mill that will grind from 30 to 50 bushels per hour. Will sell the whole outfit cheap. For further information address
GEORGE L. BONNER,
Dayton, Ohio.

FOR SALE.

Brick and Tile Works at Cresco, Ia., on line of C. M. & St. P. R. R. Side track into yard. Two good down draft kilns, one No. 6 Brewer Machine and Crusher—only used one season, one 30-horse-power boiler and engine, two dry sheds shingled, one 150 ft. long and one 120 ft. long. As good bank of clay as there is in the State. Am doing a big business. These works are in the best County in the State for sale of tile and brick. No competition. Come and see me or address,

N. B. WHEELER,
Cresco, Iowa.

FOR SALE.

Tile factory located at Mansfield, Piatt Co., Ills., at the junction of Big Four and Wabash R. R. 6,000 square feet of drying shed, 3,000 feet of steam coil for winter drying. One New Departure Tile Machine with dies from 3 to 18 inches. One 25 h. p. engine with same size boiler. Two Down-draft Kilns. All in good repair, with good demand for tile. Reason for wanting to sell—in mercantile business; have not time to attend to factory.

CLEMANS & KINGORE,
Mansfield, Ills.

Passengers for the Eastern Cities, Thousand Islands, New York and New England River and Mountain retreats, and Atlantic Coast Resorts, please bear in mind that the "Big Four" is the only direct route. Its celebrated Southwestern Limited, Special New York and New England Express, and Limited Boston are composed of the finest Vestibule Sleepers, Coaches, Cafe and Dining cars, and the schedule is so arranged as to bring passengers to their destination in the quickest possible time and at the most seasonable hours. The only line that lands passengers in the heart of New York City, giving passengers the privilege of stopping at Niagara Falls and a day-light ride on the beautiful Hudson River.

The Perkins Wind Mill.

NO DOUBT

BUT

A Fact



The Perkins is the
Lightest Running Wind
Mill now made.

BUY IT! TRY IT!

After 21 years of success in the manufacture of Wind Mills, we have lately made a complete change in our mill, all parts being built stronger and better proportioned and a self-lubricant bushing placed in all boxes to save the purchaser from climbing high towers to oil it. The same principles of self governing retained. Every part of the Mill fully WARRANTED and will run without making a noise.

The reputation gained by the Perkins Mill in the past has induced some unscrupulous persons to imitate the mill and even to take our NAME and apply it to an inferior mill. Be not deceived; none genuine unless stamped as below. We manufacture both Pumping and Geared Mills, Tanks, Pumps, etc., and General Wind Mill Supplies. Good Agents wanted. Send for catalogues and prices.

PERKINS WIND MILL AND AX CO.,
MISHAWAKA, INDIANA.

FOR LEASE.

Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap. F. C. DEVENDORF, Receiver, 244 South Water Street, Chicago, Ill.

RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental Designs, Paving Tile, etc.

BRICK MAKERS' SUPPLIES.

Tempering Wheels, Trucks, Moulds, Barrows, etc.
Send for circulars.

C. W. RAYMOND & CO.,
DAYTON, OHIO.

CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitrified Stone Sewer Pipe we Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,
Cincinnati, O.



A pamphlet of information and abstract of the laws, showing How to Obtain Patents, Caveats, Trade Marks, Copyrights, sent free.
Address **MUNN & CO.**
361 Broadway,
New York.

**STRONG,
WELL-BUILT
SERVICABLE**

STEAM ENGINES

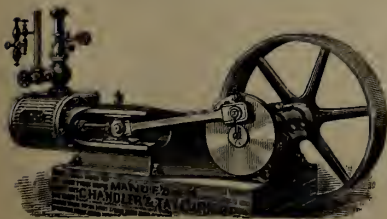
12 TO 80 HORSE POWER.

Adapted to Heavy, Continuous Work.

Every Engine Tested Under Full Load.

For Descriptive Circulars, address

CHANDLER & TAYLOR CO., Indianapolis, Ind.





Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.22 pm. (daily.)
Ar Decatur	2.45 pm.	3.55 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.15 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin Bluffs, and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, JNO. S. LAZARUS, City Ticket Agent. General Fr't and Tkt Agt.



LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.
Arrive in Chicago 2.30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily..... 11:10 a. m.
Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.
Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.
LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday..... 11:55 p. m.
Arrive in Indianapolis 8:35 a. m.

No. 81—Indianapolis & Cincinnati Limited, parlor and dining car, daily..... 9:55 a. m.
Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.
Arrive in Indianapolis 3:55 a. m.

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.
I. D. BALDWIN, D. P. A., Indianapolis.
JAS. BARKER, G. P. A., Chicago.



The Shortest and most Direct Route

East, West,
North, South.

Solid Vestibule Trains,

CONSISTING OF

The **FINEST COACHES, PARLOR, RECLINING CHAIR, CAFE and DINING CARS; WAGNER COMPARTMENT, BUFFET and STANDARD SLEEPING CARS.**

Heated with Steam and Lighted by Electricity,

FORMING

The **FINEST TRAINS in AMERICA or THE WORLD.**

Its SUPERB TRACK and UNRIVALED MACHINERY and EQUIPMENT permit the HIGHEST SPEED with PERFECT SAFETY.

It is the only line which lands its passengers at the GRAND CENTRAL DEPOT in the heart of the great city of NEW YORK, which is an advantage of NEARLY TWO HOURS in TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others, passing through the famous CITY OF PULLMAN, along the LAKE FRONT, and the far-famed MICHIGAN AVENUE BOULEVARD, in full view of the finest RESIDENCES and PUBLIC BUILDINGS. In fact, its Connections and TERMINAL FACILITIES at all points are superior to those of any other line.

Its trains enter the Central Union Station, CINCINNATI; the Union Depots, CLEVELAND, BUFFALO and ALBANY; the Grand Central, NEW YORK; the Boston and Albany, BOSTON; the Union Depot, ST. LOUIS; the Union Depot, PEORIA; the Great Central Depot, CHICAGO; the Union Station, INDIANAPOLIS, and numerous others in the vast territory it traverses between the MISSISSIPPI RIVER on the west; the OHIO RIVER on the south; the GREAT LAKES on the north, and the principal SEA-BOARD CITIES in the east.

The Indianapolis Offices of this great line are located at

**No. 1 East Washington Street,
138 South Illinois Street,**

and the UNION STATION, where tickets can be procured to all parts of the UNITED STATES and CANADA and MEXICO, at the lowest current rates, and full information as to routes, conditions, connections, etc., etc.

OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

H. M. BRONSON,
Ass't Gen'l Passenger Agent
Indianapolis, Ind.





Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.22 pm. (daily.)
Ar Decatur	2.45 pm.	3.55 am.
Springfield	4.45 pm.	6.00 am.
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Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

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The Shortest and most Direct Route

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CONSISTING OF

The **FINEST COACHES, PARLOR, RECLINING CHAIR, CAFE and DINING CARS; WAGNER COMPARTMENT, BUFFET and STANDARD SLEEPING CARS.**

Heated with Steam and Lighted by Electricity,

FORMING

The **FINEST TRAINS IN AMERICA or THE WORLD.**

Its SUPERB TRACK and UNRIVALED MACHINERY and EQUIPMENT permit the HIGHEST SPEED with PERFECT SAFETY.

It is the only line which lands its passengers at the GRAND CENTRAL DEPOT in the heart of the great city of NEW YORK, which is an advantage of NEARLY TWO HOURS in TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others, passing through the famous CITY OF PULLMAN, along the LAKE FRONT, and the far-famed MICHIGAN AVENUE BOULEVARD, in full view of the finest RESIDENCES and PUBLIC BUILDINGS. In fact, its Connections and TERMINAL FACILITIES at all points are superior to those of any other line.

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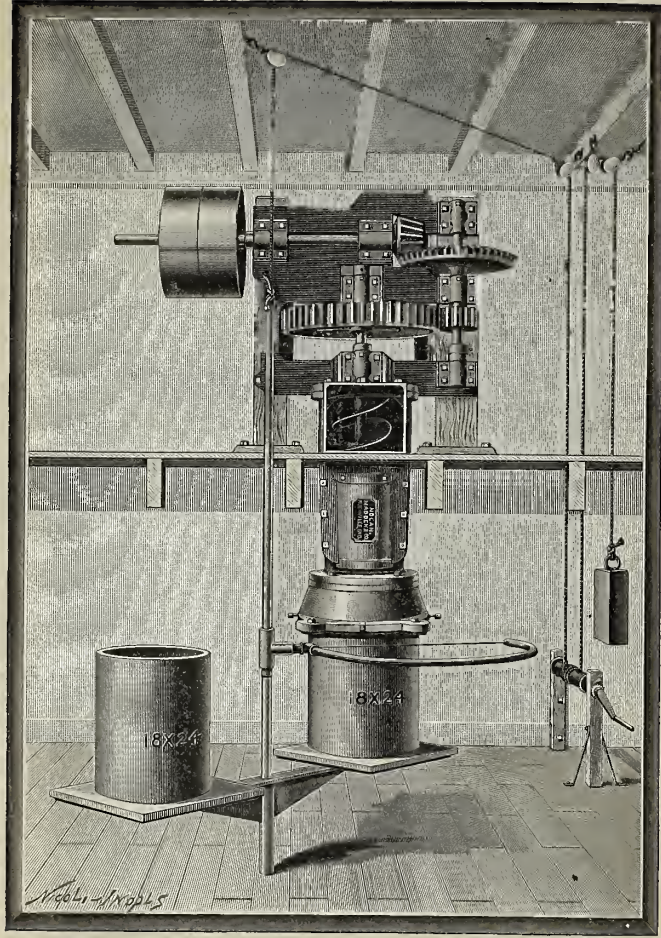
The Indianapolis Offices of this great line are located at

**No. 1 East Washington Street,
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OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

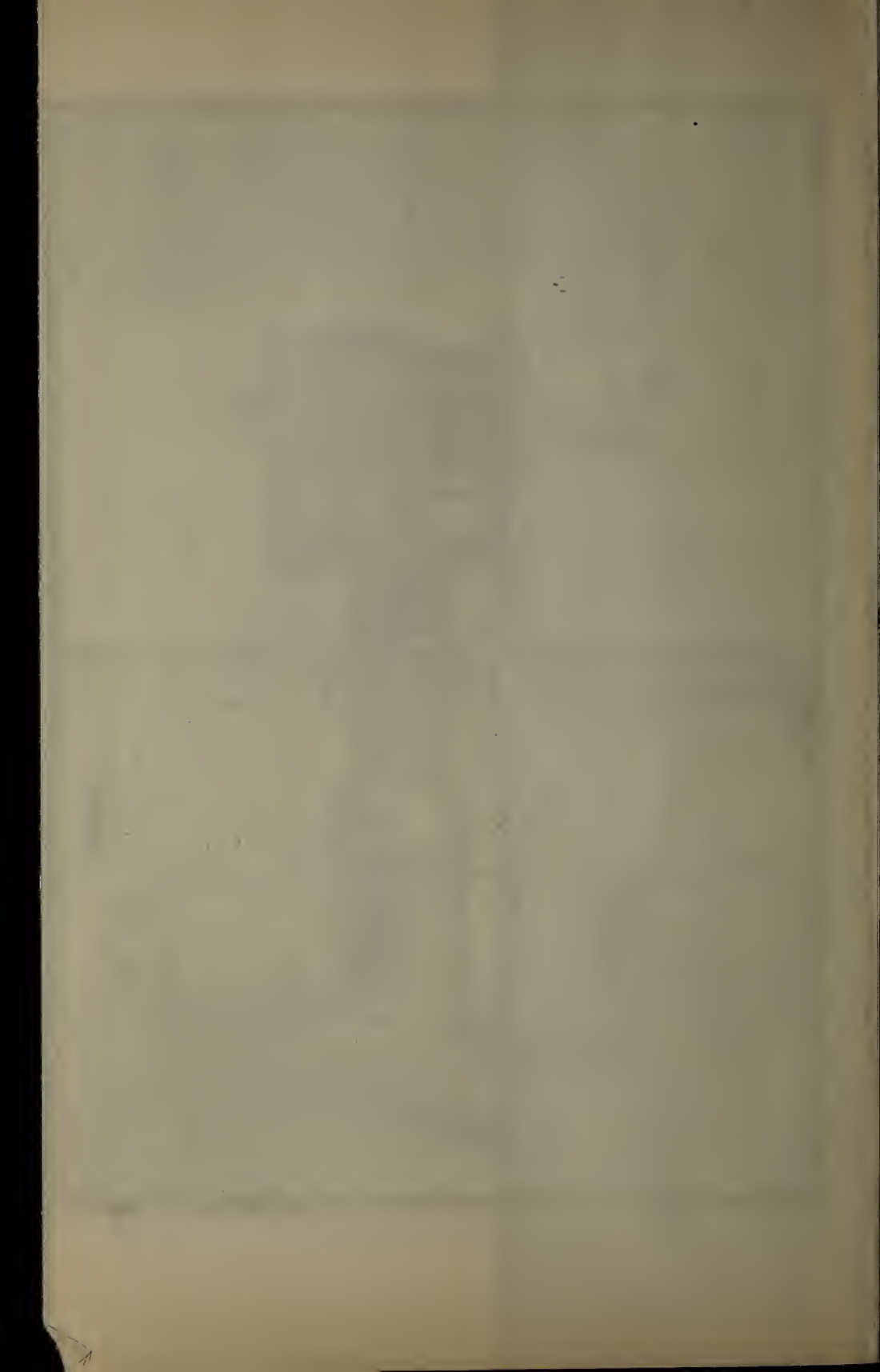
H. M. BRONSON, Ass't Gen'l Passenger Agent Indianapolis, Ind.



NO. 10. NEW UPRIGHT TILE MACHINE.

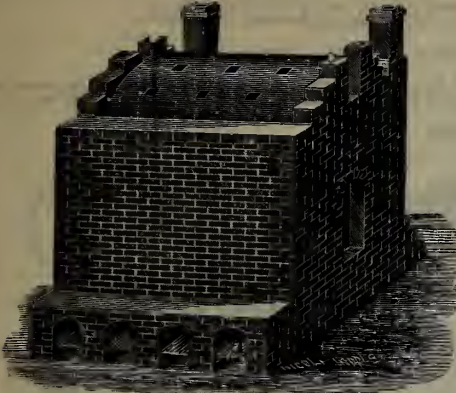
Our new Upright Tile Machine, for the manufacture of tile up to 18 inches, is intended to be used in factories where parties have machines for making small sizes. We are able to build it at such a price that anyone having a demand for large tile can afford to have one. Write us for prices.

NOLAN, MADDEN & CO.,
Rushville, Ind.



DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

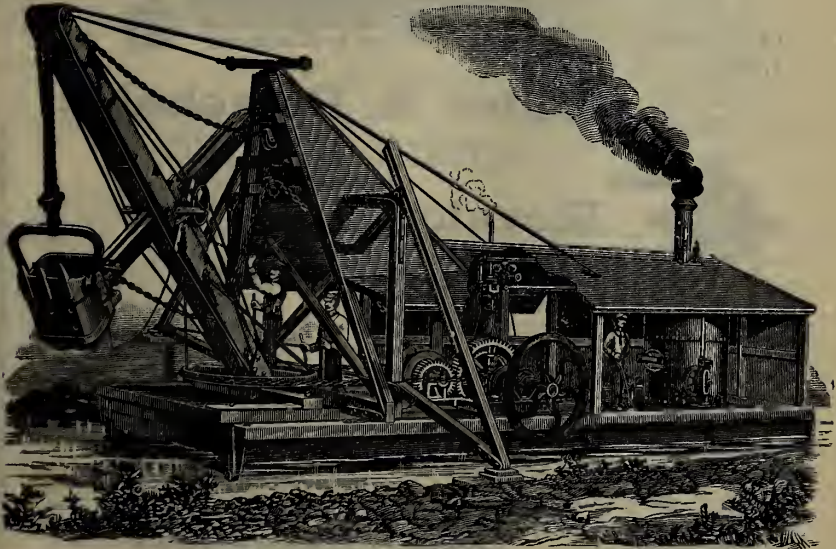
crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

W. E. DAWSON, Agent, Colfax, Ind.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



Manufactured by

MARION STEAM SHOVEL CO.,

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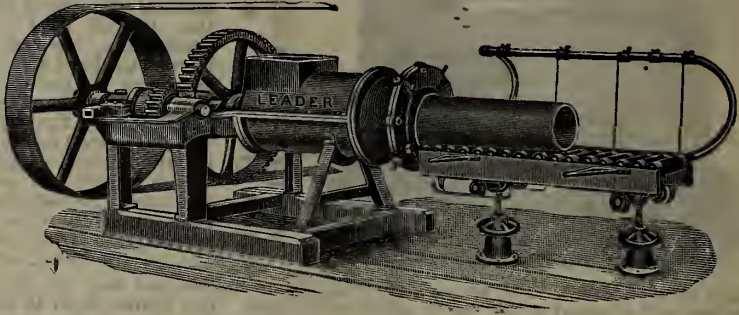
MARION, OHIO.

The Decatur Leader Mfg. Co.,

DECATUR, ILLINOIS.

—MANUFACTURERS OF—

Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,

Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR
CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



ELEVATORS

FOR TILE,
BRICK,
PACKAGES, ETC.

Roller & Detachable

CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

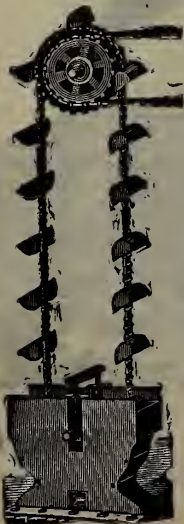
BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '91 Catalogue and prices

ADDRESS

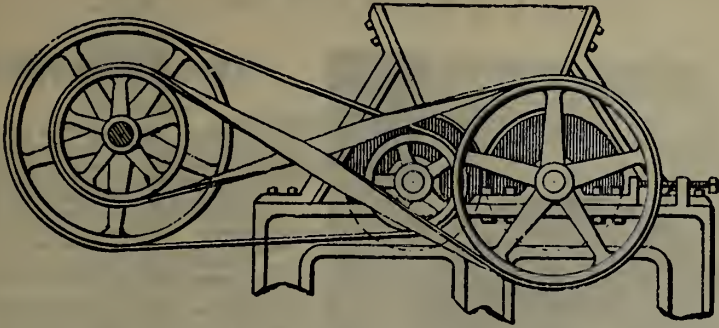
The Jeffrey Manufacturing Co.,

112 East First Avenue,
COLUMBUS, - - OHIO.



The Crusher, Disintegrator and Stone Separator

PATENT APPLIED FOR.



Every machine warranted. Satisfaction or no sale. Will work lumpy clay where other crushers fail. After a continued and thorough test, it is believed by those who are using it that the Crusher and Disintegrator as above illustrated is superior as a Crusher, as a Disintegrator and Stone Separator. Requires less power to run it. It is not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

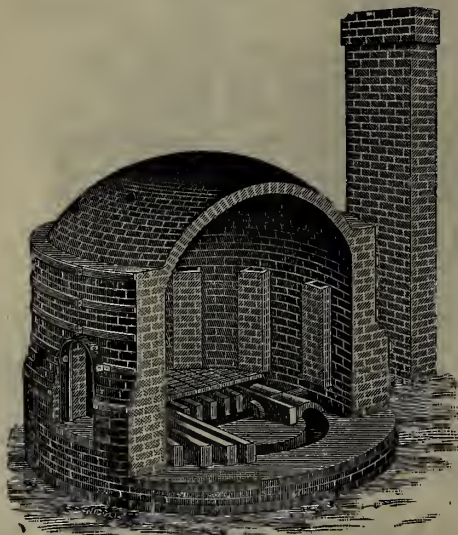
For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT LEADS THE WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bonnd with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

÷ New and Improved Brick and Tile Kiln ÷

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tilemakers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

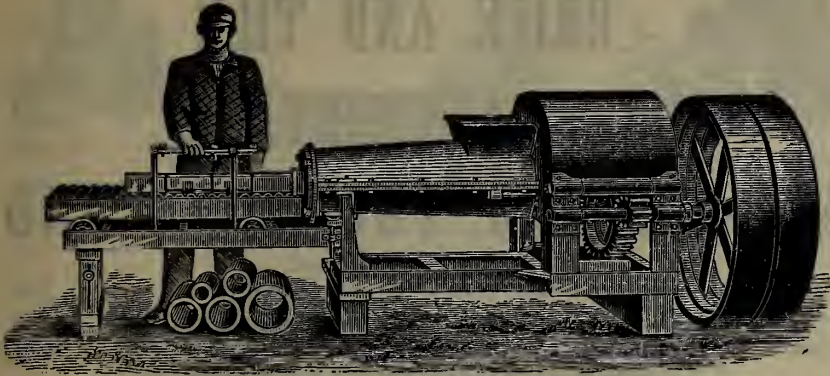
This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



J. B. GRAWCOCK, Churubusco, Ind.

KELLS & SON'S IMPROVED
Brick and Tile Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the backs and need no pressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

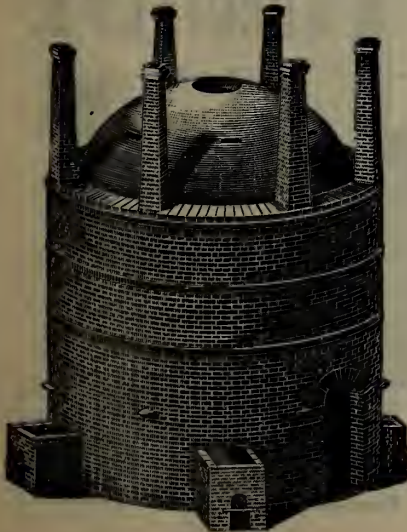
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

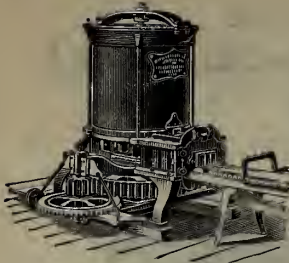
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

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CINCINNATI, OHIO



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

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Tables

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Castings.



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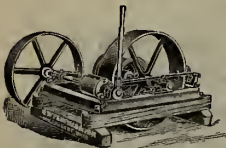
Barrows

and

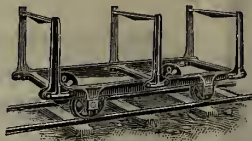
Yard

Supplies.

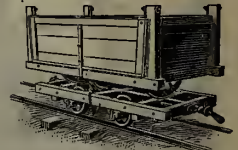
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



(Dry Car.)



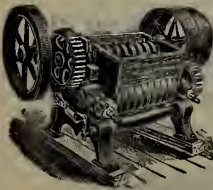
(Clay Car.)

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Willoughby,

Ohio.

U. S. A.



(No. 3 Crusher.)



(No. 7 Pug Mill.)

MICHIGAN BRICK AND TILE MACHINE CO.

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JOHN H. CAMPBELL, SEC. AND TREAS.



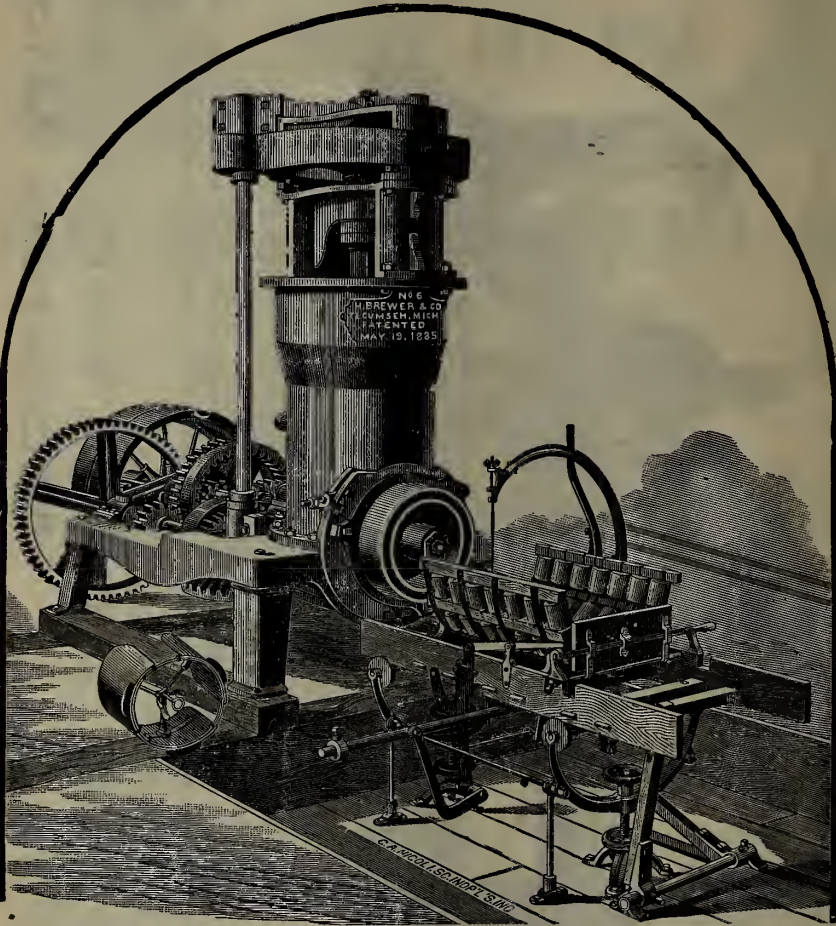
No. 1 Brick and Tile Machine.

With increased facilities and many years' of experience in the use and manufacture of clayworking machinery, we believe that we can fully meet the wants of the trade.

We shall make a specialty of furnishing complete outfits, plans of yards, buildings, etc., the latter are free to our customers. We warrant our Patent Curved Cut to make absolutely straight brick. Our machines are not excelled for speed in working or for durability. Write us for descriptive circulars and prices. Address

MICHIGAN BRICK AND TILE MACHINE CO.,
Morenci, Mich.

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Yours Truly, M. J. LEE.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

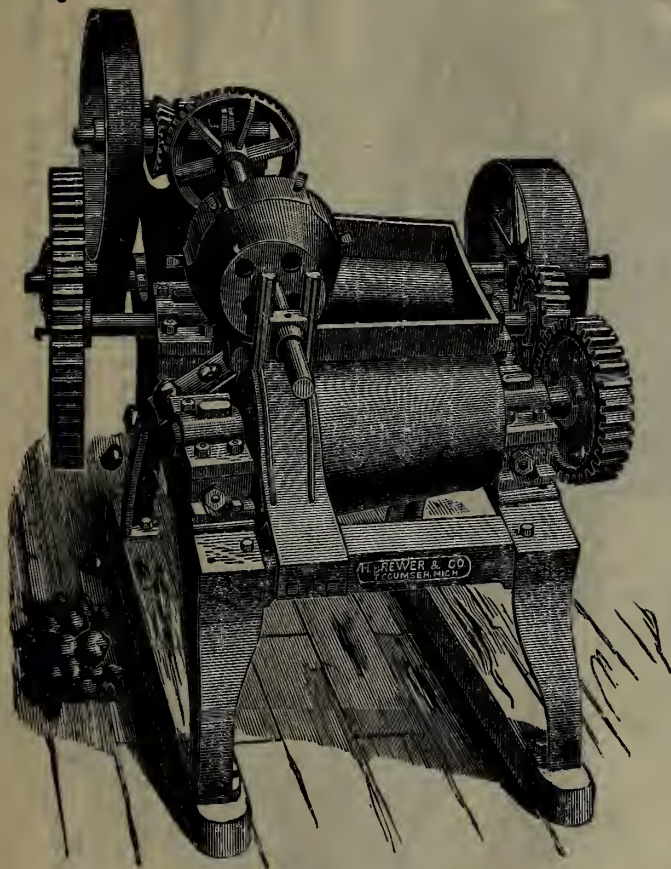
Yours Truly, JOLIET MOUND DRAIN TILE CO.

The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

- The following are among the advantages claimed for this form of construction:
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
 - 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
 - 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
 - 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
 - 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
 - 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
 - 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
 - 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

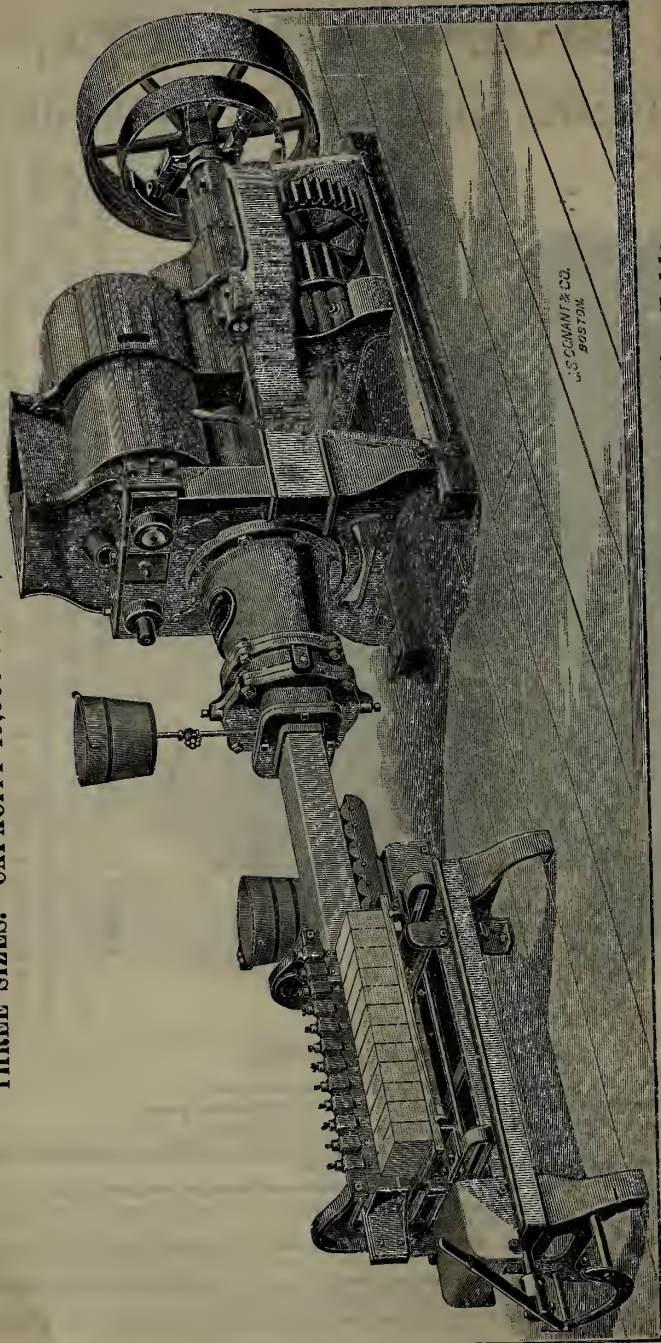
For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



"A" or Largest Size Machine with New Board Delivery Cutting Table.

Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

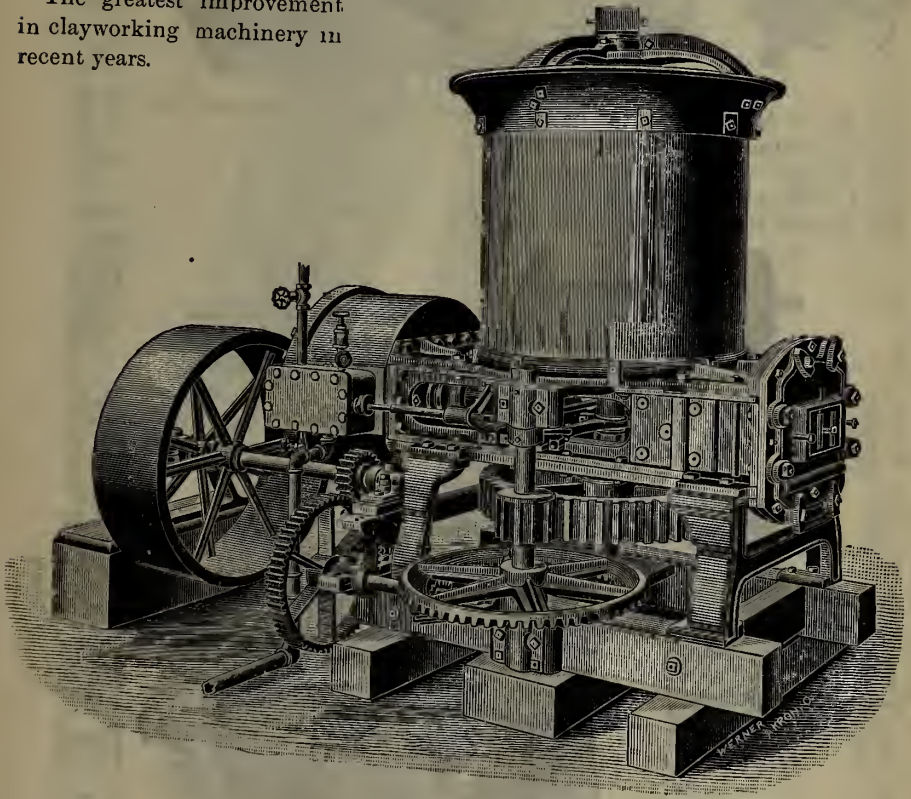
E. M. F. REESE & CO.,

PLYMOUTH, Richland County, OHIO.

[Mention this paper.

The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



PATENTED APRIL 14, 1891.

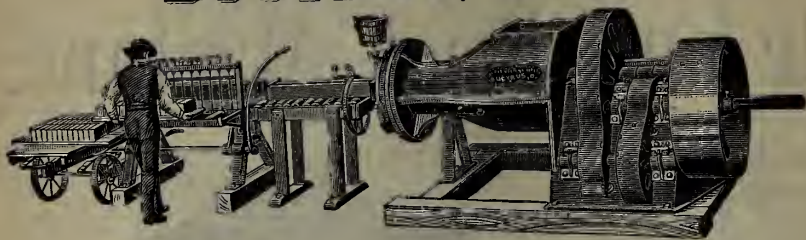
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THE NEW BREMEN MACHINE CO.,
New Bremen, Ohio.

Advertisements.

FREY--SHECKLER CO.

BUCYRUS, OHIO.



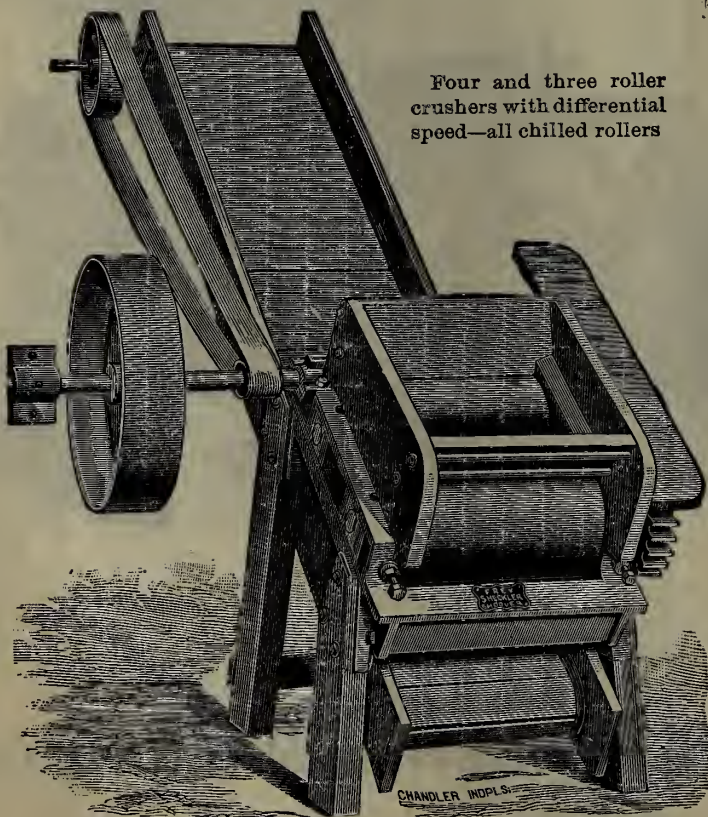
The Acme Machines—the heaviest and largest machines for tile for brick, terra cotta, lumber and hollow ware.

The Mascot—the lightest running.

The Centennial—the best clay mixer.

We furnish full outfits for brick and tile factories.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
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Elevators, Clay Elevators, Tile Elevators.



Four and three roller
crushers with differential
speed—all chilled rollers

Six Different Brick Machines; four Different Tile Machines
Crushers, Represses, Kiln Doors, Kiln Irons, Grates,
Brick Moulds, Steam Pipes, Brass Goods, Etc.

CHANDLER INOPLS.

We make thirteen different patterns of Roller Clay Crushers.

Send for catalogues and circulars to

THE FREY-SHECKLER CO., - Bucyrus, Ohio, U.S.A.

BRICK AND TILE MACHINERY.

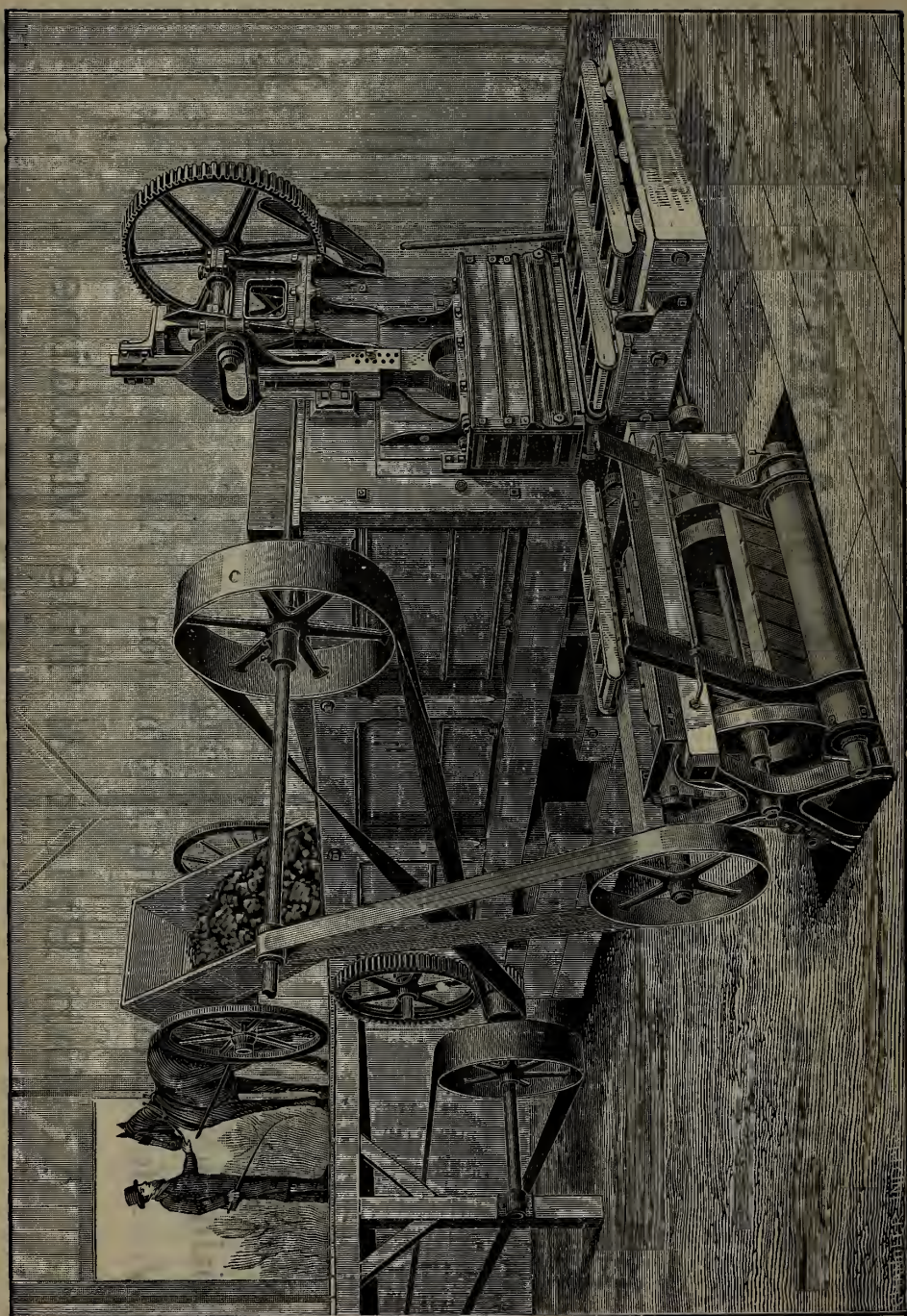


New Machinery, new Clay Conveyor, new Automatic Cutting Table,
specially adapted to cutting paving brick.

Write for Catalogue and information. Address

Adrian Brick & Tile Machine Co.,
ADRIAN, MICH.

Advertisements



The Potts Horizontal Stock Brick Machine.

Requires no extra Pug Mill to work the clay direct from the bank.
It has the largest tempering capacity of any machine on the market.
All brick made have clean, smooth surfaces and sharp corners.
It works the clay stiff enough to make the finest Stock Brick.

Our Mould Sander, shown in cut, has taken the lead of all machines for this purpose. There is no place for the moulds to catch and cause delays. It will not spill or waste any sand. It is easily and quickly adjusted to any size mould.

NOTICE:—A. H. Newton, of Cohoes, N. Y., claim our machine is an infringement on patent owned by them, and that persons using our machines will be prosecuted. As to this we would say, that we do not infringe said patents; that we have put our machines on the market only after a careful investigation to ascertain exactly what our rights are in the premises, and, being fully satisfied of our rights, we are prepared to protect our customers and Patents No. 397,274, of Feb. 5, 1889.

We are prepared to erect complete plants of any desired capacity and keep in stock a full line of **Brick Machines, Pug Mills, Disintegrators, Mould Sanders, Clay Cars and Drums.**
It will pay you to write us for prices.

C. & A. POTTS & CO.,

INDIANAPOLIS, INDIANA

Write for 1891 Catalogue—Just Out.

NEW DEPARTURE TILE MACHINE

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

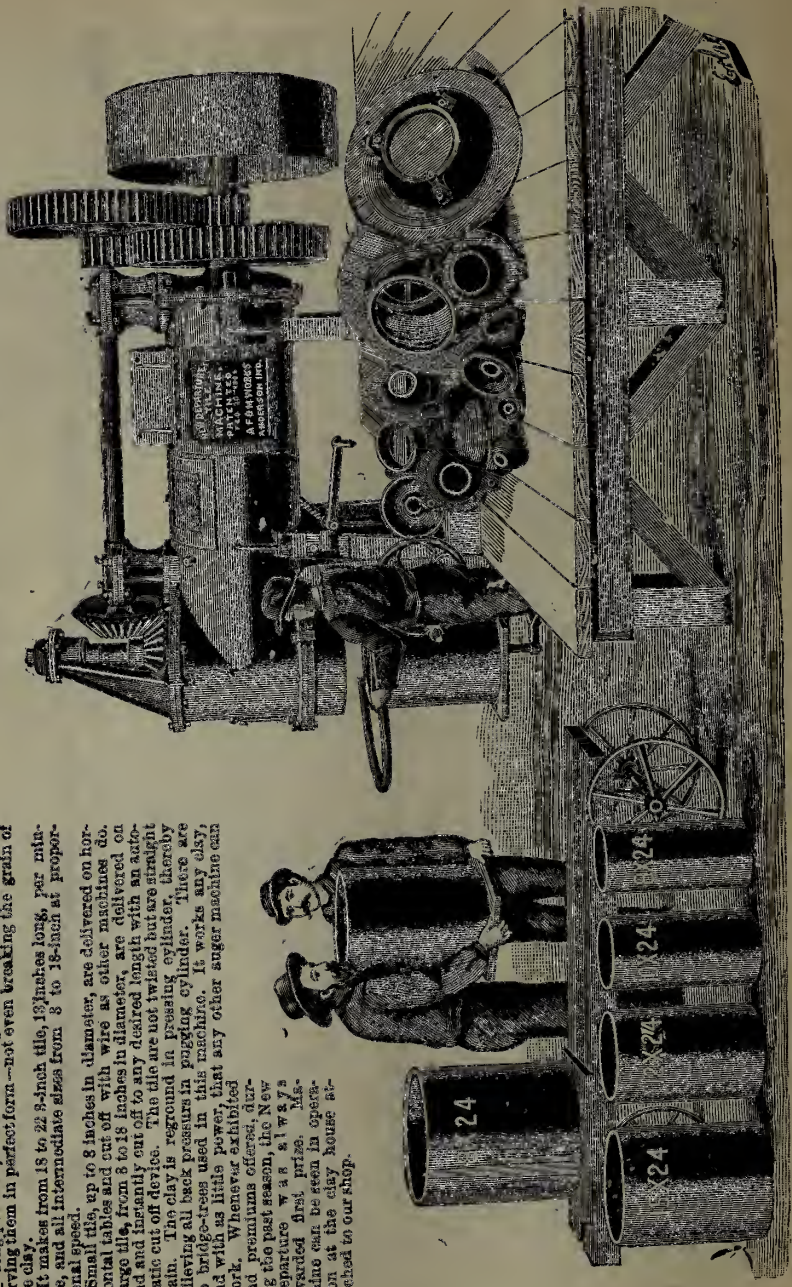
It makes from 18 to 22 8-inch tile, 13 inches long, per minute, and all intermediate sizes from 8 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and turned by a 16 to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all stress in this machine. It works any day, no big truss used in this machine. It works any day, and with a little power, that any other snger machine can not produce. When a car exhibited and the premiums offered, during the past season, the New Departure was always awarded first prize. Machines can be seen in operation at the clay house attached to our shop.

For full information and circulars, address :—

ANDERSON FOUNDRY & MACHINE WORKS,

Anderson, Ind.



TRANSIT LEVEL

FOR THE USE OF

ARCHITECTS AND BUILDERS.



FIG. 11.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

T. F. RANDOLPH,

Surveyors' and Engineers' Instruments,

51 West Fourth Street, Room 31.

CINCINNATI, OHIO.

This is a new, light and convenient instrument for leveling and taking horizontal angles without the Magnetic Needle attachment, intended for architects and builders uses.

The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and 2 $\frac{1}{2}$ in my catalogue, the price would be \$60.00.

Send for Catalogue.

THE WALLACE MANUFACTURING CO., Frankfort, Ind., U.S.A.

"LITTLE WONDER."

—MANUFACTURERS OF—

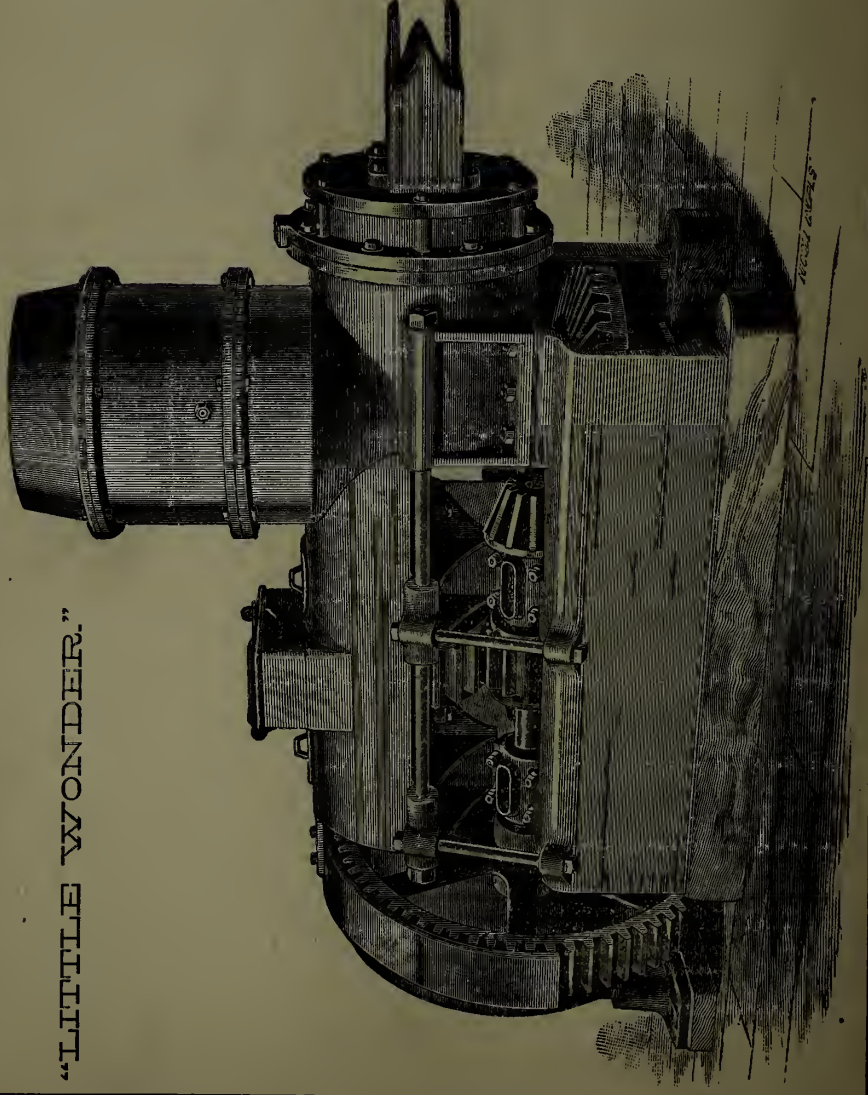
LITTLE WONDER TERRA
COTTA LUMBER, BRICK
AND TILE MACHINE.

WALLACE PATENT CLAY
CRUSHERS AND STONE
SEPARATORS.

WALLACE PATENT PUG
MILLS.

PLATFORM SPRING BAR-
ROWS FOR BRICK AND
TILE AND A FULL LINE
OF CLAY WORKERS'
SUPPLIES.

CORRESPONDENCE SOLICITED



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10¢ PER COPY.
\$1.00 PER YEAR.

Vol. XIII—No. 8.

THE DRAINAGE JOURNAL



AUGUST, 1891.

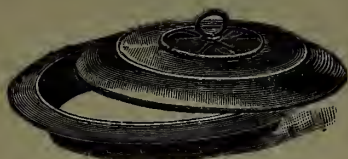
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FARM DRAINAGE,
MAN'F'R OF DRAIN TILE,
AGGRESSIVE AGRICULTURE
IMPROVEMENT OF HIGHWAYS.

J. J. W. BILLINGSLEY
INDIANAPOLIS, IND.

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Cast Iron Kiln Cover.

No Down Draft Kiln complete without it.
TILE TRUCKS AND BARROWS, KILN BAND TIGHTENERS, KILN DOORS AND FRAMES, FURNACE FRONTS, LARGE DOOR FRAMES, CAST IRON COVERS, GRATE BARS, ETC., ETC.

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NEW LONDON, OHIO.

For Illustrated Catalogue. [Mention the Journal.]



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IMPROVED COAL BURNER



Patent applied for. Combined Hood and Hanging Grate Basket. Are in successful use for burning Tile or Brick with coal in Down Draft Kilns without sub-arches or out side furnace, and it is a reliable, satisfactory Grate Basket for burning coal in common Case Brick Kilns requiring no outside furnace. For circulars, testimonials, price, address

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311 English Ave.

Indianapolis, Ind

"16" LONG RANGE TELESCOPE.



No. 1, \$25.00
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Free with Each



Do you Grade or Drain? If so, you need this Level.

Most Simple, Durable, Accurate.
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Address JACKSON GRADE LEVEL CO.,

We refer to Ed.

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DONALD KENNEDY

Of Roxbury, Mass., says

Kennedy's Medical Discovery cures Horrid Old Sores, Deep Seated Ulcers of 40 years' standing, Inward Tumors and every disease of the skin except Thunder Humor and Cancer that has taken root. Price \$1.50. Sold by every Druggist in the U. S. and Canada.

THE DRAINAGE JOURNAL

Vol. XIII. AUGUST. No. 8.

UNDERDRAINING.

*BY THOMAS M. HAMILTON.

GENTLEMEN:—Having had considerable experience in underdraining, I submit to your consideration my views as to the proper method of constructing drains, and the practical benefits resulting therefrom.

In the first place, I would seek to correct a mistaken notion that very many have with reference to the functions of the drain. Many suppose the object of an underdrain is to furnish a speedy outlet for a large amount of surface water, as it may fall in heavy rains, and thus prevent the water from standing long on the surface of the ground, thereby scalding out, as some say, portions of the growing crops, as well as to prevent the washing process consequent upon heavy rains upon more rolling lands. Not so. These are but secondary results, and of minor importance.

Lay your drains down deep (the deeper the better), for the reason that the lateral drainage is in proportion to the depth as thirty-six to one in black loam soils, and in clay, perhaps, not more than eighteen to one; that is to say, a drain thirty inches under ground will drain a surface in width $30 \times 36 = 1,080$ inches, or ninety feet wide in black, loose soil, and in clayey soils per-

haps not more than half so much, or forty-five feet; so that one readily sees how very valuable one inch at the bottom of a drain is, which gives us an additional width of two and a half feet of surface drained land. Not only so, but a second result is, that the water being drawn off, the sun light and heat are found insinuating themselves into those hitherto damp and dark chambers. Now, let the rains descend, and the soil prepared to *drink* in an amount of water, which would flood the adjacent parallel belts of ninety feet, before calling on our drain for its aid. So that we find that the office of the drain is not so much to carry off the water as it falls, as to constantly keep the soil in condition to drink in the rains, and at once appropriate its benefits (for heaven's showers are intended only to bless), and not close the doors against, and thereby convert ministers of good into ministers of evil. Those infinitesimal and countless aqueducts are none the less serviceable as air *chambers* and windows, so to speak, opening out into heaven's sunlight.

Another immediate benefit resulting, is the fact, known and acknowledged by all good practical farmers, and by many philosophically understood, that ground well underdrained stands a drouth much better than before.

But as to the manner of constructing drains. The first thing of importance is to secure a *good outlet*. Spare no pains,

*Read before the Indiana State Agricultural Society.

for without this your drains will be more or less impaired in their usefulness. If it be necessary to cross your neighbor's eighty acre tract of land to secure this, *go*—with his help, if he will, but *go* anyhow, hoping that while you are redeeming his lands by so doing from a state of worthlessness, you may be kindly introducing into the barren region of his soul that which will transplant him in a more kindly soil. Get Paddy, with his long English spade (for he is the best ditching machine yet), and if it be not full length, throw it aside, better to present him with a new one than to submit to the use of his, though worn but an inch. Hire your ditch cut by the inch, not by the spade, lest Paddy get too smart for you, and slant the spade too much, which he is sure to do. I have found this to be a very good and speedy way. Having staked out your line, take a good team and plow; run one furrow, using a cutter of course, thereby leveling your surface at once, dispensing with the line, gaining from five to eight inches, and making more graceful and regular curves than is possible to get with a line; and then with an additional thirty inches, which can be attained at two spades, you will have a thirty-five or thirty-eight inch ditch, which will amply repay you for your extra trouble over the ordinary way. Use also the scraper to clean out the loose dirt, and never in any case set foot on the bottom of your ditch. The best and only level necessary is the water, which tells with unerring accuracy, a little of which is a great help in the cutting of your ditch. Have your tile distributed beforehand; lay and cover your tile as the cutting progresses. Cut your ditch only wide enough to admit the tile.

To place the tile in the drain, take a staff five or six feet long, with an arm eight or ten inches long, inserted at a

right angle at the bottom, small enough to go in the tile, by means of which you can stand beside the ditch, and with a little practice place the tile as well or better than by hand, always observing to lay the tile in as straight a line as possible. Avoid walking on the tile, as some do while laying them, as they claim to settle them, for this can not be done without displacing them more or less. Having placed the tile in position, cover slightly with a shovel, always watching lest some might be displaced; after which use a horse and scraper, and to this end have the dirt thrown on one side. Proceed throughout upon the supposition that this is one of the *few* things appertaining to farming, which, if well and properly done, will not likely be to do over.

DRAINAGE AND IRRIGATION IN LOUISIANA.

BY ADOLPH THIEL.

To account for the better condition of cane raised on thoroughly tile drained land, it is only necessary to point out that by thorough underdraining the growth of the crop cannot be retarded during a wet and cold spell, as the surplus moisture *and the surplus only* is removed, in time, by the action of the tile. As in this case the ground cannot become over-saturated during a rainy spell, the heat of the soil is not consumed in evaporating the excessive moisture, but made available for the continuous growth of the crop. That a well drained soil is warmer than a poorly drained soil was proven by an experiment I made on the 18th of March last during the progress of my work at the Sugar Experiment Station, Audubon park, showing a temperature five degrees higher in a cut where the tile drain had

been finished, than in another cut where I had just commenced work.

It stands to reason then that in a field with inadequate drainage the water line is too close to the surface in a wet, cool season, as the latter part of winter and early spring proved to be, to permit the roots of a crop to grow deep, and the outcome is a stunted crop, too weak to withstand a subsequent drought. On the other hand, in a well drained soil, where the temperature is always higher, even during a wet spell, the roots soon grow deep—down to the depth of the tile—so that, during the change from a spell of wet weather to a drought, the roots will follow the receding moisture, furnishing the stalk with plenty of nourishment to grow and spread its leaves, which in turn shade the ground and prevent the parching effects of the sun. The pores of the soil having been kept open by the action of the tile, capillary attraction is facilitated, supplying a possible deficiency of moisture in the upper stratum.

But I doubt seriously if the soil water has receded more than four or five feet below the surface at this stage of the season. This season and that of two years ago are almost identical, a drought having set in then about the middle of March, and yet water was struck on the 25th of May, at a depth of five feet and three inches, on Mr. R. H. Yale's "Home" plantation in Ascension parish, where he had a well dug in his pasture on comparatively high, dry ground.

On a recent trip I made to Franklin, La., I noticed that many cane fields, although well worked, were very cloddy, due, without a doubt, to the prolonged wet weather in the early part of the season, which prevented the timely working and thorough pulverization of the soil. When the dry weather set in, the clammy soil soon baked and cracked, break-

ing up in clods (most of them have not yet been pulverized), and in consequence the moisture of the soil evaporated, depriving the roots of the growing crop of their feeding ground, as they can find no hold in, nor spread amongst, the clods, the result being a less promising crop.

But how different is the prospect on thorough underdrained land! By the timely removal of the excessive rainfall through the tile the soil could not run together and bake; thorough cultivation and deep pulverization were successfully accomplished, thereby preventing the evaporation of the moisture of the soil. When it is borne in mind that more moisture is stored and a higher temperature maintained in a well drained than in any other soil, the better prospect for a good crop on tiled land is easily explained.

I think that a great benefit would accrue to the sugar interest if proprietors and managers of tile drained plantations would give information through the columns of *The Planter* in regard to the looks and prospects of the growing crop as compared between tile drained land and land drained by open ditches, to help in this manner to settle the question: *Is the irrigation of the low lands of Louisiana necessary where they are deeply underdrained?*

Should the question be answered in the affirmative, I am confident that it can be successfully accomplished through the tile, and a two-fold result obtained. As the tile has proven itself adequate for the successful and timely removal of excessive rainfalls, and considering the humidity of the atmosphere in the low lands of the State of Louisiana, I am certain that such a system would prove the most advantageous method that could be adopted, as it would serve the double purpose of either

removing a surplus, or supplying a deficiency of moisture.

It is not the purpose of this article to criticise the advisability of the irrigation of the cane fields, but rather to help determine its necessity. From my own work and experience on the sugar plantations of Louisiana I am prepared to state and vouch for the following facts: After the long drought in the fall of 1889, while I was laying tile on the "Home" in Ascension, I found water in the soil at a depth of eight feet and cane roots at a depth of six feet strong enough to indicate that they reached a few feet deeper. The yield of the first stubble, where the tile had been laid in June of the previous year was thirty-two tons per acre.

If such results were achieved then there is no reason why they could not be obtained now under similar circumstances. This is the best opportunity to bring this subject to the attention of all interested in the question of better drainage and probable necessity of irrigation during droughts. Those observing the results from tile drainage will be better enabled to form conclusions as to the superiority of this system over the old method of open drains, and for myself I will say that I consider this the opportune moment to strike while the iron is hot.—[In the New Orleans Planter.

BETTER DRAINAGE NEEDED.

A wet soil is unproductive, it is cold and clammy. Wheat and clover will often be destroyed by the upheavals of frost, or damaged by wet in spring or summer. Wet land delays planting in spring, prevents tillage in summer, and often causes partial and sometimes total failure of crops. Well drained land is warmer, germinates grain quicker, promotes rapid growth, and insures increased yields.—J. A. Mount.

Farm Drainage.



TILE DRAINING ON THE FARM.

Knud Hendrickson has recently contributed an article to the "*Wisconsin Farmer*" on the above subject, from which we make the following extract:

It seems singular at the first thought that the soil which suffers most from surface water in a wet season often suffers most from a drouth. Yet a moment's reflection will show good reason for it. The soil saturated with water, bakes up under the hot sun, until the roots cannot easily penetrate it. The vegetable matter in it has not decomposed while in a water-soaked condition, and consequently it has not become available for plant food, and the plant starves even in the midst of plenty. The fact is well known to every observant farmer that only the edges and coarser weed plants will flourish on a soil saturated with water. The growth of this weed is one of the signs nature hangs out like a flag of distress to show that the land needs to be drained. When such land is drained these worthless plants usually die out and are replaced by such plants as are of value to the

farmer. I have of late laid several thousand feet of drain tiles with the best of success. I lay my tiles at least three feet deep. I like a fall of about onehalf an inch to a rod, but some give it three inches to every 100 feet. This is all that is needed, and there are perhaps no lands so level but what can be tile-drained at that rate; a drain must be laid as far as practicable down the slope. The first consideration in drainage is the outlet, or outfall some have it, as there must be a fall to carry away the water and keep the mouth clear, or the drain will not long continue to do good work. More drains are ruined from lack of good outlet at the start or neglect to properly finish the mouth of the ditch than from all other causes combined. It would be well to have some stone mason work done at the mouth of the outlet so as to give a chance to scrape enough earth upon the lower end of the drain, as it may be necessary to lay the tile more shallow at the lower end, and in such cases the filling must be rigged up from the sides to keep the tiles from freezing. A sieve may be put at the mouth of the drain to prevent muskrats getting into the drain and destroying it. I use the round tile, laying them end to end as closely as possible, particularly the upper edge. I think it not necessary to cover with hay or straw, but pack the earth carefully up to them. Many prefer to use hay for covering the tiles before any earth is put upon them, to prevent sediments working into the water courses.

HOW TO DRAIN.

We should first look up the true line of the main drain, measure it and level it to have it all correctly proved the best line and the least expensive. A little time spent in overlooking the situation is never lost. We next should remem-

ber to grade our ditches. The first thing we do is in cutting the soil away with a short spade, it is much easier done by scooping out the loose dirt and see that the water will flow freely. Then you can make your drain of an exact depth. Next remember to lay your tile of the same size first, and take the shrunken ones of that size and lay them back and use them up the drain where you want smaller tile, as to lay three inch tile and when you have one burned very hard that is only two and one-half inches you would reduce your three inch tile to two and one-half by using the shrunken tile. Lay all tile as close as possible. Leave no uncovered cracks. Leave no holes in bottom of drain. Remember that tile laid in straight lines work best. Remember that sinks or miry swamps, or quicksands must have long narrow boards that are good and solid laid in the bottom before tile is laid in any soft and bottomed ditches. Tile should not be more than one foot in length. In draining a swamp all soft and miry places must be tiled to save the crop and beasts. Don't use straw, hay or corn stalks to cover tile. They will dam the water from the tile. Cover your tile with the surface soil and with bottom soil. Remember to use plenty of bricks or broken tile to mark your drains. Broken tile of good quality can often be had for hauling from the tile kiln. Mark deep and well, as good marking will make you a good drain plot, one to last forever. Remember, too, that to have the best drainage your tile must be laid perfectly and have ventilation or air at the upper end to flow freely. Remember to have the best flow you must have good smooth tile inside, though some rough material may sometimes be stronger than the smooth is. If you lay rough tile, clean the inside. But if you can get good glazed tile they are the

best. The writer trusts that you will be able to drain successfully after reading this column.
D. F. WISE.

A BIT OF EXPERIENCE.

When I bought the farm of my aged father in 1865 only about 6 acres of this field of 35 acres had ever been plowed and that was left in bad shape. The rest was rough pasture except a little natural meadow whose numerous knolls and "cradle holes" and boulders showed that it had had little care. Some three acres were in orchard; the trees, over 50 years old, were mostly dying. Except this the whole was in a "state of nature," only that the forest trees had been cleared away more than 50 years before and most of the stumps were rotted out.

It was the current belief that the clayey soils of this region were not intended to be plowed. One old neighbor, now dead, stopped my plowing one day as he was passing, to remark, "Look a' here, Chamberlain, the Lord put that 'ere land the right side up when he made it, and the more you turn it over the wus it gets." And when I began my first large job of systematic drainage in 1875, and had plowed the furrows for mains and laterals in the fall and placed tile in small piles of 33 two rods apart all over the field ready for use when the ground way too soft to scatter them, I one day heard two neighbors talking as they drove by, each in his lumber wagon. They had to shout, almost, to drown the rumble of the wagons, and so I got the benefit of what they said. Perhaps they intended I should!

"Say," said one of them in most sarcastic tones, "Say! d'ye know what Chamberlain's a doin'?"

"No."

"Ye don't hey? Wal, then he's a *marnurin* that field o' his'n with tiles! Ha, ha!"

The piles did suggest manure piles put out ready to be spread. But the sarcasm was lost on me, for the first crop of wheat after the drainage was finished yielded 465 bushels from 10 acres. This was \$46.50 per acre in cash. The drainage with laterals 33 feet a part and 24 to 30 inches deep costs about \$23 per acre. The last two crops preceeding the drainage had been almost total failures, owing to wet seasons, although the field is high rolling land with good natural surface drainage.—*Dr. W. I. Chamberlain, in National Stockman.*

TILE LAYING HINTS.

Tiles are in general most economical to begin with and satisfactory in the long run. It costs less to dig a narrow ditch for a two-inch tile and pay for the tile and lay it, than to dig and lay a stone drain; and when done the chances of durability are in favor of the tiles. Some points must be observed carefully in laying them, however, says Massachusetts *Ploughman*. They must be laid with uniform downward grade; any deviation from this rule makes stagnant water in the tile, which will soon fill with sand or mud and cause a stoppage; carelessness in this particular causes most of the stoppages. In laying the tiles put them as closely at the joints as possible, and cover the joints with a piece of tin or of oiled or tarred roofing paper. You need not fear that the water will not find its way in, you cannot keep it out if you try; but you must try to

FILTER OUT THE SAND

and mud which may enter with a rapid stream of surface water washing down through a muskrat's hole. If the bottom is sandy or soft mud, it is often necessary to lay strips of boards under the tiles to prevent them from settling and getting out of grade, and also to

wedge them sidewise with stones to hold them in lime; for like a chain, the usefulness of a drain is measured by its weakest point, and we must avoid weak points carefully. Whenever surface water must be taken into the drains, and also whenever a long reach of nearly level drains makes settling of mud and sand likely to occur, the catch basin must be introduced. This is simply a man-hole or sand pump-hole dug a foot or more lower than the drain, and walled in with brick or with a large tile set up-right; these catch-basins need examining frequently to see that they do not fill up with sand and clog the tile.—*Orange Judd Farmer.*

AN ENEMY OF TILE DRAINING.

B. F. Johnson, of Champaign Ill., says in his Illinois letter to "*Practical Farmer*:"

"The tile cranks have carried their point and persuaded farmers and land owners to drain and draw every acre of water off, drouth appears to have come, and come to stay, and the threat now is, that prairie Illinois is soon to become as subject to drouth as Kansas and Nebraska. If the fires were drawn and quenched in every tile kiln in Illinois, if tile drains were plugged, open ditches and sloughs filled, and creeks and rivers dammed for the coming 18 months, and the total rainfall were retained in the country, the soil and sub-soil of the prairie portion of the State of Illinois would not receive moisture enough to warrant the yield of average crops of all kinds of characters for the following three years."

"Some years ago during the great drouth Mr. Johnson fairly gloated over the apparent triumph of his pet peculiar theory (or heresy) that tile drains cause drouth. At that time was published overwhelming evidence going to show that crops on drained land suffered

least during the terrible drouth referred to. Indeed, that was the general opinion of intelligent farmers that had tiled their land. To-day the opinion remains unchanged, but Mr. Johnson against all odds sticks obstinately to his hobby. We have utterly failed to hear of a single farmer that having tiled his land in a proper manner has repented the deed. Tiling has been the most popular and beneficial innovation in Western agriculture and all the anti-drainage agitators throughout the world will fail in their endeavors to stay the progress of a practice so profitable and so correct in principle. The record of tile draining throughout the world is that it does not hinder the production of crops but vastly assist in that work. If it were true that drains cause drouth the record as to crop production would be of a very different character.—*Farmers Review.*

NEED OF UNDERDRAINAGE.

Another problem is drainage. Two wet seasons in succession have forced even careless persons to notice what an advantage drained fields have over wet ones, and in Ohio the leanness of many a farmer's pocket-book is a direct result of trying to farm on wet land. I heard one farmer say in a public meeting, the other day, that he believed that his yield of oats was from 15 to 20 per cent. less nearly every year than it should be, simply because of wet places that delayed sowing the whole field, and themselves rarely brought anything but rag-weed.

The other day I went to a horticultural meeting near Matthew Crawford's, where the land is a heavy retentive clay. For two or three miles we passed magnificent fields of wheat on gravelly soils, much of which promised 25 or 30 bushels per acre (one of my neighbors has 50 acres as good as that); but when we reached

the clay, where it was not underdrained, it will hardly be worth cutting. One large field of, I should think, 20 acres was a sorry sight. It got a fair start in the fall, but wet feet all the latter part of the winter and spring was too much for it. The difference between what is and what might have been on this one field, will be probably 400 bushels, which at \$1 per bushel would pay for considerable draining, especially if the work were done with farm labor at odd spells.

—*Ex.*

IOWA TILE DRAINAGE.

WHEN IT BECOMES PROFITABLE TO TILE.

Few would drain land when it cost more to dry an acre of land than to buy a dry acre, says Jas. Wilson in Waverly (Ia.) *Independent*. When the home market is equal to the consumption of all our grains and most of our meats and dairy products and prices have doubled for some grains, it is in order to look after the acres on the farm that are rich, wet, and worthless. Tiling is the best way to dry land, and tile is now to be had at most points for less money than ever before in Iowa. Draining can not be done correctly by every tyro. It will pay every farmer who undertakes to drain, to

READ UP ON THE SUBJECT;

to visit those drains still running unclogged, made years ago, on land similar to that in hand. Many drains choke up and are worthles. Much money has been thrown away by bad engineering, particularly where the fall is not decided. A main drain and spurs is better than parallel drains, unless the tile is carefully graded in size, as distance brings more water. Four feet deep is necessary to get full benefit from the drain. Tile can not be laid too close. The water will go through the joints. Trees growing contiguous will fill the tile with

roots. Shallow tile is reached by burrowing animals and by frost. Well drained land will grow crops in very unfavorable seasons, like the present. Well laid tile will last a life time. The farmer must study how to lay the tile, and can afford to trust nobody to superintend the operation, until he proves them. Tile must be clear of lime specks, must be perfectly sound and well burned, or it is lost time putting them down.

A BIG DRAIN.

The contract has been let for a large tile drain extending from the Benson Tile Works to Fox river. This drain will be nearly two and a half miles in extent, eighteen inch Joliet tile to be used, which will be laid at an average depth of five and a half feet. The total cost of the work will be about \$5,000, which will be paid by special assessment upon the property benefitted, and all the property owners interested united in bringing about the accomplishment of the scheme. By this improvement all of that low, springy territory lying southeast and south of the city limits, and considerable property inside the present corporation, will be effectually drained, and over three hundred acres of land that is now practically useless reclaimed and rendered highly valuable. During the coming year doubtless this entire property will be on the market and will be among the most desirable in that portion of the city. Work has been commenced by Mr. Edwards, and will be hurried along as fast as possible. Then the contract for the big Waubonsie slough will probably be let soon, and this is a job of much greater magnitude. It will consist of an open ditch three miles or more in length, to empty into the river at Oswego. This ditch will be seven feet in width at the bottom and twenty-four feet at the surface—and it is

expected that it will drain the entire Waubonsie slough territory. The bids will be opened Friday, and the intention is to have the work pushed through immediately.—*Aurora, (Ill.) News.*

DRAINAGE IN WISCONSIN.

The governor, the board of land commissioners and Attorney General O'Connor will go to Manitowoc tomorrow to look over swamp lands in Manitowoc and Calumet Counties which are to be drained in accordance with a law passed last winter. Residents in Calumet County have been fighting the proposed scheme, and a sharp fight was made in the last session. The differences between all parties have now been satisfactorily settled, and all the commissioners will have to do is to authorize the carrying out of the plan and provide for the assessment of benefits and damages.—*State Journal.*

Agricultural.

SMALL FARMS.

The most successful farming I have ever seen has been on small farms, and in my own practice the most profitable and pleasant farming I ever did was on a farm of forty acres. A majority of farmers, I think, have too many acres, and would make more money and do less hard work if a part of their land was sold and the money invested in improving the acres left. Many farmers act as though they considered the great object in life to die possessed of many acres, while undoubtedly it ought rather to be to enjoy comfort as they pass along their journey.

I have had a chance to contrast the large and small farms to some extent the past winter, and I have been confirmed in the opinion that as a rule the

man with a small farm has less care and a larger per cent. of profit than one with a large farm. On the large farm there is a loss of time in drawing the crops, taking out manure, and in getting around to feed stock, and the owner cannot give that personal attention to details which the owner of a small farm can, and as a consequence there must be innumerable small losses which aggregate a large sum.

The man who manages a small farm, first to supply his family all that he possibly can for their support and comfort, and then choose wisely some specialty for a money product, will, as a rule, be found prosperous even in hard times. I have not met a better specialist at the institutes the past winter who was complaining of hard times. I have known poultry farms run at a handsome profit and various specialties which have brought comfort and competence to their owners. The family with a full supply of fruit, vegetables, poultry and dairy products, meats and breadstuffs supplied by the farm, and which has a surplus of each to dispose of to pay bills, can live easily and comfortably on a small farm, and will not need to cultivate a great breadth to meet expenses, for these can be kept down to a low limit. It is not the acres we cultivate, nor even the bushels of grain produced, that determine the profit of farming, but the most important factor of all is the art of production, and next to that is the wisdom with which we feed and sell the products of the farm.

A common mistake and one which means life-long bondage for the farmer and his wife is to buy a second farm after they reach middle life and run in debt for a part of it and increase their cares and labor without increasing the net profits.—*Waldo F. Brown in Country Gentlemen.*

SOME CAUSES OF HARD TIMES.

The farmer is seeing hard times, but what is the remedy? Is it to sit down and talk politics, curse monopolies, grumble at trusts and ask for impossible legislation? Three-fourths of our farmers by their own acts increase their expenses unnecessarily. They buy what they do not need, and in many cases take no care of what they do buy. New machinery and tools are purchased when the old if repaired properly would do good service for years and the interest on the money paid for new would keep them up. Thousands of dollars are thus squandered every year and we complain of hard times. Of course, first-class tools are essential to good farming. But another essential is to keep them in repair.

Our farmers are in many cases trying to reach a twelve-foot persimmon with an eight-foot pole. Many of the older farmers are in easy circumstances and have acquired small fortunes. They live well, spend money freely, and can afford it. But for the small farmer who is in debt or is just starting out to undertake to follow in the footsteps of the man who has already twenty, thirty, or forty years the start of him is folly and the result ruin.

A comfortable home is one of the greatest blessings. But we can be comfortably situated without many of the costly luxuries that our retired neighbors can afford. A man can do very good farming with a draught horse. It is not essential for a farm team to trot a mile inside of three minutes. It costs more to train a fast horse than it does to run a five-hundred acre farm. Only men that have money to spend can afford it. Our greatest drawback is that we live too fast. There are always two ends to a procession and we cannot all head it. The cry is, "farming does not pay;" farm-

ing pays better than trying to imitate some rich capitalist. The idea has become prevalent that we might as well be out of the world as out of fashion. This rule may apply to the society man who spends his money at fashionable watering places in summer and in Washington during the winter. But it is a ruin to the farmer of small means. Worst of all we patronize too many humbugs, and are made victims of sharpers whoes only aim is to live without work. Too many of us are anxious to get something for nothing. It requires economy, patience, perseverance, and toil to make the farm pay. But if we devote one-half our time to politics and divide the other half between work on the farm and trying to get suddenly rich by questionable methods, then "farming won't pay."—*J. J. New, in American Agriculturist.*

WORK OF EARTH WORMS.

Darwin estimated that worms, by swallowing earth for the sake of the vegetable matter it contains and forming castings, bring to the surface as much as ten tons of earth per annum on an acre. Worms are great promoters of vegetation by boring, perforating and loosening the soil, and rendering it pervious to rains and the fibres of plants, by drawing straws and stalks of leaves and twigs into it, and, most of all, by throwing up such infinite numbers of lumps of earth called wormcasts, which form a fine manure for grain and grass. The earth without worms would soon become cold, hard-bound, void of fermentation, and consequently sterile; this has occurred in many cases where the worms have been either accidentally or intentionally destroyed, and the fertility of the soil thus lost has only been restored when the worms had again collected and resumed their fertilizing work.—*Fruit Grower.*

RATIO OF PROFIT IN A COW ACCORDING TO YIELD.

A great many dairymen have very dim and indistinct ideas of the difference in the net profit of a good cow, over a poor one, or a better cow over a good one. It is a good thing to have something to compare by. Mr. J. H. Walker, who is a noted breeder of Jerseys, puts the question in the following light:

Ten 200-lb. (butter) cows would yield a profit in ten years of \$2,000.

Ten 300-lb. cows would yield a profit in ten years of \$4,250.

Ten 400-lb. cows would yield a profit in ten years of \$6,487.50.

Ten 500-lb. cows would yield a profit in ten years of \$8,875.

Ten 600-lb. cows would yield a profit in ten years of \$11,000.

This would be the net yield after deducting \$25 a year for keeping from 2 years old to 12 years old. The product to be disposed of at 25 cts. a pound and none accredited with full yield until five years old.

We invite the attention of all to the ratio of increase of profit from the 200-lb. cow to the 400-lb. cow. The yield is not only double but the profit has trebled. A large proportion of this increase in profit, is found in the decrease in the cost of production. The cost of bodily maintenance is the same for a 200-lb. cow that it would be if she gave 400 lbs. It takes a deal of pounding to get this important fact into the heads of our dairy farmers; but it plays a mighty important part with their profits even if they don't see it.—*Hoard's Dairyman*.

THE STUDY OF BOTANY.

A gardener who does not understand botany has no chance to progress in his profession; he is a mere laborer in the vineyard. It is an extremely simple science to one who loves plants, and in a very short time a knowledge of "fami-

lies of plants" is gained by which any plant, however new, can be placed and even its cultivation indicated near enough to enable one to grow it successfully. There is no study so fascinating, so enticing and so satisfactory. It is like getting acquainted with a large family of people who are alike but different, some sober and quiet, some brilliant in conversation, others useful and willing, while all have a general desire to be agreeable.—*Ex.*

THE MILKING STOOL.

As the cold increases, increase the feed.

It takes just as much feed to support the cow in a warm stable; the balance goes to make milk or flesh.

In a good dairy cow all the surplus goes to make milk.

In a general-purpose cow part goes to make milk and part to make flesh.

The larger part to make flesh.

This goes on for years and then the flesh is solid.

Not the flesh made the first year, but the annual renewal, for the g. p. cow gets thin at least once during the year.

If she is owned by a g. p. man her thinness is chronic.

But a cure is made the fast few months of her life.

And when she is sold it must be hard to say where the profit was.

In a cold stable much more feed is required than in a warm one.

It is cheaper to warm the cows with a tight stable than with extra feed.

And a comfortable stable will be comfortable for the milker.

He will take more pains to get all the milk.

And will not be cross to the cows.

Change the food often—if you can give better feed each time.

But if the feed is good, no change is needed.

Don't forget the salt, and let the cows judge as to the quantity they want.

That is, give them access to salt every day, in stead of putting a fixed amount in their feed.

Give the young stock salt also.

It injures butter if it gets frozen.

Good butter will "stand up" in a higher temperature than poor butter.

But extremes either way are not good for the butter.

In selling milk to consumers, stir it before dipping it out, so each customer will get his share of "richness."

Don't try to cover up defects in the quality of butter with color.

Don't over-color; you can easily out-do nature.

If you think that coloring butter is "fraudulent" just explain it to your customers and see them smile.

If you have found out any thing new and useful in dairying just write it out and send it along; all of us want to know about it.

If you think it will injure your business to tell about your discoveries you are mistaken.

No good dairyman is small enough to suffer injury by trying to help others.

Don't forget to strain your cream before you churn it.

Either wear an apron coming high up on the breast or brush your clothes well before you handle butter.

Woollen garments are constantly shedding wool.

Wool is hair, and hair in the butter is not desirable.

If you have no wooden paddles to handle the butter with make some, and don't touch the butter with your hands again.

It makes no difference even though you are a woman.

Women make better butter than men because they can see or smell anything that is wrong quicker.

And they will take more pains to right it.

Men say they "guess that will do;" women say, "That won't do."

But a woman always insists that her hands are clean.

And so they are, but they ought not to be put in the butter.

Wrap your butter in parchment paper; it is better and cheaper than muslin.

It doesn't count much to feed, but it helps and the cows will eat their night's ration just as usual.

You want to keep up as even a yield as possible.

You won't injure the cows by milking them up to two weeks before calving.

If the calves are thin at birth, 'tis well, because veal is only worth a few cents a pound but butter many.

And the thin calf, if a heifer, will make a good cow.

If you are dairying for fat calves, then it is another matter; dry up your cows three months before calving. Let the poor things take a rest.

And after a while you will take a rest—from dairying.—*Stockman & Farmer.*

POT SOIL FOR NEXT YEAR.

Collect a lot of grass sods, make them square. Lay a square, say four feet each way, on the ground under a shed to keep off heavy rain. On this layer put a few shovelfuls of fresh horse manure, then a layer of sod, and so on till you have a pile three or four feet high. Keep it slightly moist, not wet by any means. About the first of September take a sharp spade and begin on one side, shave down the whole pile in cuts not over one inch thick. Throw this into a squire pile made a little dishing on top. Keep it moist as before. In November turn and mix it thoroughly, keeping it in a compact heap and it will be ready for potting plants for the house, and the older it gets, the better it will be.—*Ex.*

SOME REMEMBERS IN DRAINAGE.

Remember that a tile drain ever so well laid, if its outlet is not looked after and kept open it will not work well.

Remember that the straighter your tile are laid in line, the better the flow of the water.

Remember that it is cheaper to have a good tile drain than to lose your crop on untiled land, or in some cases to only have half a crop.

Remember it is cheaper to have tile drains in your swamps, than to swamp stock.

Remember it is cheaper to have tile drains than to have your field full of plowed out ditches to run your machinery over and break them, as the money lost in this way would often make your tile drains.

Remember it is cheaper to make tile drains than to have your field full of plowed out ditches and have your stock roll in and die.

Remember a sheep lost in this way, if sold would buy many tile.

Remember a good colt or a good horse lost in this way would be something; if sold would go far toward tiling a farm.

Remember, if you could not sell that horse from your farm, that to have used the money that was required to buy another horse, would have gone far towards tiling your farm, and would have saved your horse, saved crossing ditches and breaking your machinery and vexation; instead of having nice, even fields to reap over and an abundant harvest to reap.

Remember that if you must have field ditches, take a road grader and make them. They will not wash out like plow ditches, but they are all still dangerous to stock if made very deep.

Remember that too deep spading occasionally will make a soft slushy bottom

to lay your tile in, and your tile will never work perfectly. Have a perfectly solid bottom, evenly graded and you have a good job.

Remember, oh remember last of all, to see to it that your tile are all laid right and never let job work, but better pay by the day and have your tile all laid an even depth. If tile are laid in a ditch and water partly covers them, they will be likely to fill up to the water, and you pay for work half done. Don't let tile be covered before you see them if possible.

Remember it is when you have no places on your farm that are too wet to produce any crop that it is then that by good culture you can bring your farm to the highest state of productiveness of your locality.—*D. F. Wise, in his Treatise on Drainage.*

FARMERS as a whole are not brilliant, nor are they highly refined; they know little of arts; they know only so much of older nations as their histories and newspapers teach them; in the fashionable world they hold no place; but in energy, in industry, in hardy virtue, in substantial knowledge, and in manly independence, they make up a class that is hard to be matched.—*Selected.*

LET a boy once distrust the love or the tenderness of his parents, and the last resort of his yearning affections—so far as the world goes—is utterly gone. He is in the sure road to a bitter fate. His heart will take on a hard, iron covering, that will flash out plenty of fire in his after contact with the world, but it will never—never melt.—*Ike Marvel.*

GOODNESS and strength in this world are quite as apt to wear rough coats as fine ones.—*Ike Marvel.*

Road Drainage.



WORKING ROADS BY TAXATION.

It is said that the condition of public roads in any country indicates the state of its civilization. If this is the criterion by which we are to judge our country, says A. H. Mallory, in the *Madisonian*, we would conclude that its civilization is at a very low ebb indeed. How this state of things is to be remedied is rather a mooted problem to determine. Of course every one has his opinion as to the best method to adopt to have the roads worked satisfactorily. Some are of the opinion that the present road laws are adequate to every purpose for having good roads; but be this as it may, the truth still remains that the public roads in this country, as a general thing, are in a very poor condition. We do not doubt that if the present laws were rigidly enforced that the roads could and would be worked better than they now are; but such is not the case. Neighbor has to deal with neighbor in this matter, and consequently he does not feel disposed to press the law in cases where it

is not fully carried out, and, as a matter of course, the roads in most instances, are not attended to as they should be. And now would it not be better for all parties concerned to work the public roads by taxation? Would not the dissensions and hard feelings engendered a great many times be obviated by adopting this system? We think so. It is true that the tax for such a purpose would fall heavily for a year or two on each hand subject to road duty; but after the road-bed was properly made, the cost of keeping it so would be but a mere trifle comparatively. Even admitting that the tax for two years was two or three dollars per capita, it is reasonable to suppose that after that time, if the road has been properly worked, it would not be more than twenty-five or fifty cents a hand per year. The writer knows of a portion of public road that was worked as roads should be, about ten or fifteen years ago, and but little work has been done on it since that time, although that road is now in fine condition.

If the proper kinds of implements were used, such as are manufactured for working roads, a great deal of work could be accomplished with but little manual labor. Very few hands, comparatively, would be required for this purpose, and, as we before stated, when the road-bed has once been established, it would be an easy matter to keep it so. We would be glad to see this subject agitated thoroughly, and some plan formulated by which the public roads could and would be worked better, and with less bother and trouble to all parties concerned; for evidently, the present system is very unsatisfactory as it now stands to say the least of it. We would be glad also to hear from the brethren on this subject, for it concerns every farmer who has road duty to perform.—*Ed.*

Tilemaking.



THE DIFFERENCE IN THE CLAY.

A somewhat amusing and instructive incident occurred at one of our most thriving cities quite recently. A prominent brick firm were succeeding in the conduct of the business, turning out forty or fifty thousand brick per day. The clay was free from stones and easily tempered. The brick machine turned out the bricks without the aid of a pugger, crusher, or any attachment to prepare the clay. Everything run smoothly from Monday morning till Saturday night. The firm were piling up the shekels—were yet quite as prosperous.

The success of the firm became quite well known. Another gentleman concluded he would embark in the business and purchased a site for his works a quarter of a mile distant from the works before referred to. He bought a leading brick machine, expended several thousand dollars in the erection of buildings, set his machinery, employed the necessary help and started up. But from the start there was trouble. The brick as they come from the machine were imperfect. He concluded that the fault

was with his men—they were green. He scolded, swore and fretted, but all to no purpose. Finally he concluded that the fault was in the machine, and wrote the manufacturers to that effect, and not getting reply as soon as he anticipated, he telegraphed them to come and fix it or take it out. But kept on trying to do something. The manufacturers sent a man a distance of over five hundred miles to adjust and start the machine. When he got on the ground he saw at once that the fault was in the clay, but concluded he would lead the operator gradually into the light of the situation, by making some inquiries.

"Well, what is the matter?"

The proprietor replied:

"Well, sir, I am getting — tired seeing the works over there running every day in the week, turning out 40,000 brick, and here we are stuck in the mud. I am — tired of it, I tell you."

"Suppose we take a sample of your clay and compare it with theirs," the agent mildly suggested.

"I don't care a — about the clay. It is brick I want."

"But they have to have to be made from your clay!" the agent replied.

"Don't care a — if they do, the difference can't be in the clay," said the proprietor.

The agent then suggested that if he would get crushers and a pug mill, to prepare and temper the clay and separate the stones from it, he would doubtless succeed in making a good brick.

"What in the — do I want with a carload of machinery, besides the brick machine; I bought it to do the work, and it's got to do it, or I won't pay the balance on it, and I'll sue the firm for damages."

The agent replied:

"You cannot expect to work tough,

stony clay, with the brick machine alone. You can't make brick out of stony clay unless it is properly prepared, and the stone separated from it; it is not reasonable. The clay at the other works is homogeneous, and does not require the working that yours does. You can't get a brick machine without any attachment to work and prepare the clay, that will work this clay satisfactorily."

The proprietor, after much blustering and swearing, concluded to let them put in crushers and a pug mill. The machinery was ordered by telegraph and the agent stayed on the ground until it arrived, and set it up. The result was, that the new works were able to turn out an excellent quality of brick, and with satisfactory speed.

The lesson to be learned is, that those who have no experience in the preparation of clays, have little if any knowledge as to the wide difference in the character of clays. They readily conclude that the fault is in the machine.

It has occurred many times in the experience of manufacturers of clay-working machinery, that a machine is reported a failure by the purchaser, and an expert is sent to learn the trouble. When he gets on the ground he finds them trying to work wet, dry and lumpy clay through the machine at the same time. He takes a little time to wet down the clay, so as to make it of even temper throughout, and then has no difficulty in working it. The lesson once learned is not forgotten by the operators, but it is costly experience.

The failure of machinery to work anything like good clay, in nine cases out of ten, is the fault of those who operate the works. Clayworkers can never learn too much about the difference in the quality of clay and what is required to make a clay or clays work satisfactorily.

That which is true in working clay

for the making of brick is alike applicable in the manufacture of tile. There is yet something to learn, and that something, when learned, may add much to the success of operating the business.

Correspondence.

How a Greenhorn Makes Tile.

Editor Drainage Journal:

First we have a 15 h. p. engine, 25 h. p. boiler, and a McKenzie tile machine, No. 2. We employ 6 men in all; have 2 dry sheds, one 150x18 feet, the other 100x16 feet, with a row of stalls 5 feet deep on each side, and set the tile on 6-inch shelving.

For tile up to 5-inch, we draw direct from the bank, of which we have 4 feet of blue or swamp clay; for larger tile we have to draw the clay into the pit and let it sweat over night. Can make from 10,000 3-inch per day of 10 hours up to 5,000 8-inch, 13 inches long. Our clay dries without cracking much; can dry in 24 hours with a good drying wind.

We run our tile from machine to sheds on trucks. Have two men to truck, one to cut off, one to shovel into machine, one to draw the clay and an engineer.

We use an up-draft kiln 16x18 feet on inside, with permanent arches, and sub-arches 4 feet long on the outside. Set the tile 8 courses high, then one course of green brick and one of burned for platting. We take pains in setting tile in kiln to have all parts even. We put across the corners brick, so that 4 will just reach, then 2, then 1. This fills the corners with about 2 on 2, which gives draft clear to the corners, so we have no soft tile. If the brick are not burned hard they are left and burned again.

We use from 10 to 15 cords of wood in burning; fire very slow until the water-

smoke is all off, then slowly raise the heat until the kiln is hot all through. Now is the time to get the kiln even, which usually takes from 6 to 12 hours. We then close one head and burn slowly till *nearly* done, then the other head till entirely done, then finish the first. Our motto is "Go slow with your fire." We were taught to change our fires every 6 hours, but think we lose heat in changing. We go no stated length of time between fires, but fire when it needs it. Try to burn every other week. It takes 2 days to fill with 3 wheelers, and 1 setter, and 2 days to empty. Our tile come out even and in good shape and we can sell all we make, and more if we had them. Next spring we intend building another kiln, also a dry shed to dry with steam.

Have been in the business 6 years and don't know it all yet.

Do wish the Michiganders would revive the old, dead, tilemakers' convention that died three or four years ago. Think it would be a good thing for us all.

A GREENHORN.

Wants to Know.

Editor Drainage Journal:

I have been a subscriber and reader of the DRAINAGE JOURNAL since it first started, and have found much in it to instruct me. One thing I have not learned that I would like to know is, Are there any practical tile dryers? I see several advertised that are strongly recommended for brick, but, so far, none that seems practical for tile. What I would like to know is, Is there any practical way of drying tile artificially? If so, what, in your judgment, is the best?

This is asking a good deal from you, but we must ask if we would receive. Our clay will bear to dry fast. We have made and set tile in kiln in three days, and as large as 15-inch dried in the air.

They might be dried in a dryer in a much shorter time, I would think. I don't know as I would want to dry all my tile in a dryer—not yet, to work all winter, but would want something to dry late in the season, and early, so I could supply sizes needed.

W. S. RICHESON.

A Few Notes from Louisiana.

Editor, Drainage Journal:

The way they fix their long handled shovels here, beats anything I have ever seen; it makes them much more effective. The blacksmith beats the edge down all around, about two inches back, till the shovel sits about level on the anvil, and draws the edge down pretty thin. Then it is used for all kinds of ditching, the same as a spade. The negroes have a great knack with them. Dirt will stick to them much less than in their regular shape. I shall never use a shovel any more in any other shape.

Yesterday was pay day here, and I had a chance to notice the aversion of the negroes to work on Saturday, particularly. It took me till nearly noon to take up all the work, but none of them would do a lick on their own work, while they were sitting all about waiting their turn. They might have done a half a day's work as well as not. As for asking a job nigger to work Saturday afternoon, you might about as well ask him to work Sunday afternoon. He will break all the other nine commandments with alacrity, sooner than the one.

St. Patrick, La.

F. L. DELFER.

A TREATISE ON DRAINAGE.

We are in receipt of a small treatise on drainage published by D. F. Wise, Ashland, Ohio. There are many practical suggestions in the little work. We have used two extracts from it in this issue of the JOURNAL.

Brick and Tile News.

The Belmont Brick and Tile Works are in full operation.

An addition has been built at the Erlin (Ohio) Tile Works.

The Abingdon Tile Factory is making some excellent brick, it is said.

P. J. Slater's tile shed burned down at Elizabethtown, Ind. Loss \$800, no insurance.

There is talk of locating a jug and tile factory at Carthage, Ill. There is an abundance of good clay.

Longview, Ill., has a large tile factory for which it is claimed that there is only one larger in the State. Hall, Davidson & Co., proprietors.

The Decatur Brick and Tile Co., Decatur, Ill., organized with \$30,000; incorporators, John G. Shea, Lewis B. Casner and Orlando C. Stafford.

The Buffalo, (Ia.) Brick and Tile Works are being pushed to completion as fast as possible. They will soon be ready to produce 40,000 brick per day.

Mr. Hausberger, of Hartsburg, has taken the contract of laying thirty-two miles of tile drains in Prairie Creek and Sheridan Townships, in Logan Co., Ill.

The directors of the Caledonia Brick and Tile Co., Grand Rapids, Mich., have elected the following directors for the ensuing year: C. W. Wernette, R. J. Kennedy, J. G. Nordella, John McQueen, C. E. Hauser, J. E. Meehan, Geo. Carmody.

Vancleve Bros., Bellefontaine, O., have largely increased their capacity for making tile. This they did in order to supply their increased demand, and time and money have not been spared

in perfecting what is now a first class manufacture. Employment will probably be given to ten hands and several teams as they are having a nice trade at various points, at a distance, where tile as large as eighteen inches are not made.

B. A. Thornton, an employe at the Parkersburg Brick and Tile yards, met with a painful accident Tuesday A. M. He caught the forefinger of his left hand in the turn-table and mashed his finger so severely that it had to be amputated at the first joint.

D. A. Poyner, City Engineer, of Dallas, Texas, called upon us during the military contest in this city. He was the first to start a tile and brick works in the State of Texas. He brought with him his new cane level for leveling drains and other uses. It is a unique device, being a correct level, giving the grade of the bottom of a ditch or pipe, and is also a walking stick or cane. It may be manufactured so cheaply as to sell for three or four dollars.

A serious accident occurred at the clay pit of Liston & Harris Tile and Brick Works by which two men were severely injured — Chas. Kinney and Chas. Bouillon, the former of whom was thought to be dangerously injured. They were engaged in undermining the bank when it suddenly gave way and fell. Buillon was caught about the lower limbs and painfully though not dangerously hurt. Kinney was less fortunate, being just in the act of raising a shovel full of dirt he was caught in a stooping position and completely covered up. After being taken out he lost consciousness for a time. He was removed to his home and a physician summoned, and at this writing it cannot be determined what the result will be.—*Carlinville (Ill.) Enquirer.*

AN AIM IN LIFE.

Legrand Dunlap was the second son of a wealthy business man, Charles C. Dunlap, of the county town of D —, in the State of —. From early childhood he had been favored with every advantage of education, first at the common school, afterwards taking a regular college course, graduating with honor. Legrand was a bright boy and man, but up to the time of his graduation and a year after, he had made no choice of any of the learned professions, or of any business pursuit. After graduating he made some visits to relatives in other States, had a good time, and then returned home. His father offered him a position in his business, which he declined for a time, saying that after a year or two, he might conclude to take an interest in business life, but, for the present he was determined to take things easy. The impression that had fastened itself upon his mind during his college days was, "Father has plenty of money, and is making money, and there will be plenty to keep me, if I take care of it. There is no need that I should select and fit myself for any calling in particular." He had determined that he would read and keep himself well informed upon all the living questions of the day, which would be an open door to good society. In short, he would be an educated gentleman of leisure. He had two sisters of whom he was very fond, and in his leisure spent much of his time in their society. His elder brother, Edwin Dunlap, was also well educated, but he had fitted himself for a business life, and, agreeable to his father's wishes, he had taken a prominent place in his father's business house, and allowed himself little time for recreation.

Legrand, at the end of a long summer day in June, remarked to his two sisters,

Misses Flora and Clara, that he had it in mind to take a trip the next day, to be gone for a month or more, but where he was going they could not by any means get him to tell.

Sure enough the ten o'clock train of the following day found him at the railway station with a large valise in hand, waiting to take the 10:15 train for the country. The secret of his mission was, that he had made up his mind to go into the country, a few miles away, and get board at a farm house and spend his time in eating, sleeping, and roaming through the country, to gratify his curiosity as to country life. An adventure that he thought might contribute to his fund of information and amusement in after years.

Thirty miles distant by rail, was a stretch of splendid farm lands, which he had observed and admired on his way back and forth in his visits home during his college days. He thought that section of country had the appearance of being prosperous and so charming that it would be pleasant to spend his time there.

So it was that Legrand Dunlap stepped from the train at Fairview Station and made inquiry for some farmer that might likely furnish him with the accommodations desired. He was referred to Mr. George Hallowell, who was near his buggy, making ready to return home, which was three miles distant. Mr. Dunlap soon made the necessary arrangement for board, if the accommodations should suit him when he should see them.

A half hour's drive brought him to his stopping place for the next six weeks. The farm house was large and commodious, the grounds were beautiful, and the table spread with an abundance of eatables, nicely and appetizingly served on a snow white table cloth, and the

room assigned him was sweet and airy. He said to himself:

"Well; I am a 'lucky dog.'"

For two or three days he did little else but eat and sleep, then he roused up and began to look about him. There were six in the family, three sons and one daughter. The eldest son, he was informed, was in the city engaged in business. The next in age, a daughter named Edith, and the two younger boys, Charles and George. The mother was neat, quiet, intelligent—a queen of the household, but not demonstrative. Mother and daughter were busy much of the time with their household duties. From his room Mr. Dunlap would occasionally hear a piece of music played on the piano, and now and then snatches of song—that was all for the time.

After the season of rest he became somewhat interested in the work of the farm. Mr. Hallowell invited him to take a look at his stock. It was a new field to one who had lived only in the city. Many of his questions were ludicrously simple, but very carefully answered and explained by Mr. Hallowell. Practically, Legrand Dunlap was but a child in knowledge of the leading pursuit of his country. He did know a horse from a cow, or a hog from a sheep, but he did not know wheat from barley in the field ready to harvest. And he knew nothing as to the management of the farm, succession of crops, methods of cultivation, laws of breeding, care of stock, or the disposition of the various products. He did know, as a matter of education, that the population of the country were dependent upon the agriculture for food and clothing; that the general business prosperity was dependent upon the products of the soil. He had heard his father talk about the effect of good and bad crops upon his business, until the impression had been

fastened upon him, that the success of a business life was in some way dependent on the farm. But he had never dreamed of the breadth of knowledge necessary to make a successful farmer. It was to him a new field for thought and investigation. And, be it said, of Legrand Dunlap, that notwithstanding his self satisfaction in the past, in his father's accumulations, that they would be sufficient without any special effort on his part, he did wake up to an interest in farm life that was not to be expected. Mr. Hallowell said of him in after years, that "he was the most inquisitive youth he ever met."

After the first three days he spent but little time at the house, he was out witnessing everything to be seen on a large farm, most of the time in company with Mr. Hallowell. One day they came to where two men were ditching in a field. To Legrand Dunlap it was a new thing, and he began to ask questions.

"Why do you dig these trenches and lay these—what do you call them, Mr. Hallowell?"

Mr. Hallowell replied:

"Tile.' We call them 'drain tile.' I will explain to you, Mr. Dunlap, why we do it, for I suppose it is a new thing to you."

"Yes, it is. Never heard of it before."

"First," said Mr. Hallowell, "the tile are made of common clay, burned in kilns. You have seen the factories where they are manufactured, I suppose?"

"Yes sir, I have seen them from the cars. That is, I have seen the piles of tile but know nothing of their use," Mr. Dunlap replied.

"Very well; these trenches are dug to the depth of three or four feet, as you see; the depth depending somewhat on the character of the surface, the fall of the drain and the outlet. It often occurs that the outlet cannot be had to allow of

deep drainage, but where the outlet will admit of it, it is better to drain deep. On my lands we lay the tile from three to four feet deep. The inclination should be regular, and the greater the fall the less size of tile will be required. However, I do not lay any tile of less capacity than three inches. Drains should be straight, or as near straight as the drainage will allow. It requires much care in laying them. I learned one of these men how to lay tile five or six years ago, and pay him by the day; he is very reliable, otherwise I should see every one of them laid myself, for the reason that a very slight mistake, or a little carelessness might seriously effect the efficiency of the drain. As to the benefits of drainage, there are many. This land, though already provided with a pretty good surface drainage, is a cold clay land. In the early portion of the season it turns heavily and does not pulverize readily, but will be more or less cloddy. After it is underdrained it will break up easily and pulverize with very little work. The water passing down through the soil to the drain will effect the subsoil—make it porous. These drains in this soil, compact as it is, will only draw the water from the soil on each side a distance of thirty feet, probably, after the drain has been working a year or two, so I put in the drains about fifty feet apart as you see. Half way between them it will relieve the soil of an excess of water only a foot in depth, perhaps—anyway only that depth for a year or two. The depth that drains will act away from the tile is increased for several years. By removing the excess of water we have a soil that is easily made fine, a warmer soil, and a much greater depth of soil. Depth of soil is very desirable, to allow the roots of the growing crops a greater extent of feeding ground, and at the same time it will al-

low the roots to go down deep into the soil and are thus better protected against extreme dry weather. By underdraining we get rid of many water-loving plants, and the soil being in such fine tilth we are better able to cultivate and keep our crops clean of weeds. After being underdrained this soil may be stirred in two or three hours after a heavy rainfall,—the water goes right down, leaving only that that is necessary for the growth of crops. Otherwise the excess would run off over the surface and take off some of the best of the soil and salts necessary to the fertility. The surface washing of the soil is ruining many of our best farms and the remedy is more grass and more underdrainage. Another important benefit—one that we cannot fully comprehend—is, that the underdrainage admits of the circulation of the air through the soil. The air is as needful to the well being of our crops as is the necessary moisture. Many of the important changes necessary in providing food to feed our crops is brought about by the air."

"Yes sir; I know that in the study of chemistry we are acquainted with this fact, that the oxidation and many important chemical combinations are effected by the elements in the air. And this is a field for thought, Mr. Hallowell," Mr. Dunlap replied.

"Well, you see where it comes in, by having studied chemistry, and know how important it is. As to the gain to be had by underdrainage, this field, after being thoroughly underdrained, will almost double its yield of products. Especially is this true if I sow it to clover, and turn the clover crop under the second year, even the second crop of clover. Such a rotation of crops as will include clover every third year. But, it is near dinner time, mother has hung out the flag," Mr. Hallowell remarked.

At the dinner table, Mrs. Hollowell made inquiry as to Mr. Dunlap and Mr. Hollowell's employment of the time for the forenoon.

"I have been taking lessons in under-drainage," Mr. Dunlap replied.

"Oh, yes; you have been up where they are tiling the land. Father explained it all to you?"

"Yes, Mrs. Hollowell, and it was very interesting to me. I am such a green-horn that I need to have everything explained to me," Mr. Dunlap replied, with a broad smile. "To tell the whole truth, Mrs. Hollowell, and I may as well out with it, I came here to rest a little from the claims of society, and have a good time lounging round. It never entered into my head that there was so much to be learned about a hundred things on the farm. I don't see how I could ever master the calling."

"Oh, that is a matter of education," said Mr. Hollowell.

"I suppose so, but I would certainly be a dull scholar."

The fact is, Legrand/Dunlap woke up to be another man. He had come with the impression that he had forgot more of the essentials of knowledge than they ever knew. He had, occasionally, a word with Miss Edith, but she was perfectly indifferent to him. True, she answered his questions and replied to his sallies of wit, sang and played occasionally of evenings on the piano, otherwise she passed about the house as quietly as her mother and never seemed anxious to be in his presence. Indeed, he thought that she rather avoided him. He said to himself one day, "I wonder if she thinks me beneath her notice—it looks a little that way. Then he laughed outright at the thought—"What would my fashionable sisters say, if I was to marry this chit of a country girl?"

He determined to make himself more

agreeable and see if he could draw her into a confidential social relation. He had traveled some, had read much, had been in society a great deal for a young man of his age, and could talk when he chose to. For the next four weeks he made the most of his powers, but the effect was not what he anticipated.

Miss Edith had smiled approvingly, had evidently appreciated his account of travels, and description of men and things, but her brown eyes seemed to read him in a light that was not satisfactory to himself. He was at his wits end for once in his life. He renewed his efforts but without avail.

It came to him at last that he was genuinely in love, that there was but one woman in the world to him, say what his sisters and friends might, and she was a simple farmer's daughter, but he loved her!

He gave the matter serious consideration. He said to himself—"She knows that my father is wealthy, that I will be able to live in elegance, that her every want can be met that money can purchase. Yes, yes, but dare I run the risk of making her an offer of marriage?" was the perplexing question. His indecision worried him. At one moment he was ready to say, "Yes, I will," at another, "Not now," his anxiety all the while increasing. He walked back and forth in his room regretting his want of courage, until, at length, he brought his foot down with a stamp, saying, half aloud:

"Yes, I will ask her, and end this uncertainty."

[CONCLUDED IN NEXT NUMBER.]

AMERICANS MUST BE CAREFUL.

Standish—"What's that? You say you were attacked by highwaymen on the way here?"

Winthrope—"Yes, and robbed of every cent, after being beaten insensible."

Standish—"Honest citizens ought to go armed."

Winthrope—"I was armed."

Standish—"Then why didn't you shoot?"

Winthrope—"I was afraid some of the highwaymen might be unnaturalized residents, and I did not wish to risk plunging my beloved country into a foreign war.—*New York Weekly.*

TO INTEREST ALL EUROPE.

Personnel of the World's Columbian Exposition Commission.

Five special commissioners will sail from New York on July 9th, with the purpose of arousing throughout Europe an active interest in the World's Columbian Exposition. Much has been accomplished already in this direction by the Department of Publicity and Promotion, but it has been recognized from the beginning that the best results could be obtained only through personal visitation by influential men, officially representing the Exposition. The time has come when it is believed that the interests of the Exposition abroad will suffer severely if there is any further delay in dispatching such commissioners upon the mission indicated. Accordingly, they will start at once. Those who will go are: Judge Lindsay, of Kentucky, a member of the National Commission; A. G. Bullock, an influential citizen of Massachusetts; Hon. Benjamin Butterworth, Secretary and Solicitor-General of the Exposition; Fred. W. Peck, President of the Auditorium Association, and one of the Exposition directors; and Maj. M. P. Handy, Chief of the Department of Publicity and Promotion. These gentlemen, between them, will visit the capitals and chief cities of all European nations, and will confer with government officials and such foreign Expo-

sition Commissioners as have been appointed, and will see that they fully understand how great the Exposition will be, and that they have all desired information concerning it. The party will be abroad about two months. Meantime, Gen. Grosvenor, of Ohio; Prof. Ellis, of Oberlin College, and John M. Butler, of Philadelphia, as Special Commissioners of the United States Treasury Department, will make a tour to Europe to explain to officials and others the customs regulations under which foreign exhibits may be brought into this country.

TALMAGE ON HARD WORK.

There are very few men or women with character stalwart enough to endure continuous idleness, writes Dr. Talmage in the *Ladies' Home Journal*. I see a pool of water in the country, and I say: "Thou slimy fetid thing—what does all this mean?" "Oh," says the pool of water, "I am just stopping here." I say: "Didn't you drop like a beautiful gem into a casket of other gems as you tumbled over the rock?" "Oh, yes, I sang all the way down from the cliffs to the meadow." I say again: "Didn't I see you playing with those shuttles and turning that grist-mill?" "Oh, yes, I used to earn my living." I say again: "Then what makes you look so sick? Why are you covered with this green scum? Why is your breath so vile?" "Oh," says the water, "I have nothing to do, I am disgusted with shuttles and wheels. I am going to spend my whole lifetime here, and while yonder stream sings on its way down the mountain side, here I am left to fester and die, accursed of God because I have nothing to do." Sin is an old pirate that bears down on vessels whose sails are flapping in the wind. Morning, noon and night, Sundays and week days, thank God for plenty to do.

The Drainage Journal.

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WHY NOT?

Why not speak in praise of the occupation of farming, for a season at least? For the past fifteen years we have heard the business run down and belittled until the larger number engaged in this useful occupation are set in the opinion that it is a starvation business. Demagogues and agricultural deadbeats have taken the stump, hoping to exaggerate the discouragements of farm life so impressively that they will get a following that will land them high and dry in some political office. These together with chronic grumblers make about the most doleful procession that tramp the highways of life.

There are successful farmers—farmers who make money by being intelligent, industrious, thoughtful men,—men of broad views, and at the same time take care of the details of their business. They don't make their money by trading, except in selling the products of their own farms for the best market prices. To get the best prices they have established reputations for marketing the best products.

"The eye of the master fatteneth the horse," is an old Scotch proverb, but it has a very practical application in business methods. The successful farmer does not loiter around the corner grocery when his business needs his "eye" to keep it from running to waste. The successful farmer does not spend hours in talking politics when his farm is running to weeds. He finds that the true basis of success is diligence in business. The "mortgage" racket has no terrors to him. He does not worry himself about the slavery of the business, for the reason that he is independent. The grazing herds are his, the fields of waving grain are his, the swaying branches of heavy laden fruit trees are his, the well filled barn is his, the comfortable farm house with beautiful surroundings are his, and the bright intelligent family is his. He has every reason to be happy—to speak in praise of his calling. It is the highway to certain success, if traveled by a brainy, thoughtful, industrious man, one who prides himself in working out his own fortune by utilizing the God given forces, which are his, if he make them available, which he can do, if he has the brain power, and persistent pluck, to use the means at hand to attain the end in view.

Such examples of success are living witnesses of what may be done in the business of farming. Their farms are well arranged, the fence rows are clean

—not overgrown with briars, weeds and bushes, the gates swing upon hinges, the lands are well underdrained, if they need it—and most farm lands do, more or less—the manure pile is a daily accumulation of such matters as will enrich the soil, that have not been leached out by every rainfall before being applied to the land. They study the character of their soil, know its needs, and supply them so far as they can.

The successful farmer does not demand class legislation to help him out of a hole, or seek to make a monopoly of his business.

The deadly foes to successful farming are, want of diligence in business, of thoughtful, intelligent management, the lottery of speculation and chronic grumbling. Cast these Jonahs overboard and the voyage over life's sea as a farmer will be a true success.

With good crops, and a promising future, it is a good time to boom farming a little. Try it. Look up the bright things that may be said about and of the calling.

ROOTS IN TILE DRAINS.

In a late number of the *Country Gentleman* Mr. John E. Parmly writes:

"I have heard it stated that the roots of most agricultural plants do not injure tile drains 18 inches under ground. It is asserted that if such roots get in during the growing season they will be washed away after the crop has been removed or when the growing season is over. We have in places great quantities of what is known as "smart-weed." Last year we found a tile drain well nigh stopped. It was in a sod field, where there were some hassocks and other weeds. But the weed we noticed the most of, and, as a general thing, right over the line of the drain, was the smart-weed mentioned above. We nat-

urally supposed (although we had no positive proof in that we failed to follow the smart-weed into the drain tile) that this lot of smart-weed sent roots down into the ground as far as about three feet and well nigh filled the drain tiles with roots, for the tiles were in places as full of roots as they could be. So I made up my mind that the depth of the tile drain was not the only thing to be desired. The ground over and near the drain must be kept free from any growth which is liable to send down roots for water. Of course, care should be taken as to what trees are within many feet of a drain. I do not know how far trees will send roots in search of water, but there are trees, *e. g.*, our cherry and willow, which I would prefer not to have nearer a tile drain than about one hundred feet. Of course I mean this to apply only to permanent drains and good-sized trees."

Mr. Parmly's experience with smart grass, of the larger variety, especially, is not uncommon. There are many kinds of weeds and grasses that will send down roots into tile drains. Mr. Woolley, of Hilliards, Ohio, some years ago, had occasion to take up a tile drain laid at the depth of four feet, to replace it with a larger drain. He did the work directly after wheat had been cut, and he found that wheat roots had gone down to the tile. Yesterday (July 14) we finished digging a cellar on land that has been in wheat this year; we found that the roots of wheat had gone down through eighteen inches of soil, twenty inches of clay mixed with cobble stones, penetrating several inches into an underlying strata of sand and gravel. In digging the cellar we found it most expeditious to shovel out the sand from under the clay as far as convenient with common dirt shovels, and then, with a few strokes of the pick, fall two or three yards of

earth at a time. In excavating the sand the wheat roots (small feeding roots) were so numerous as to hang in bunches from the overhanging clay. The roots in some instances had penetrated through the soil, underlying clay and boulders and down into the sand, in all a distance of five feet. The entire field is probably underlaid at a depth of four or five feet with sand and gravel. As a proof of this there is seldom any flow of water over the surface, except when the surface is hard frozen, and then only a short time, the water of a hard rainfall is quickly taken down into the soil. This land is as effectually underdrained as any soil could be with tile. Crops on this soil suffer but very little from the severest drouths, is the testimony of the oldest settlers. The clay underlying the top soil is tenacious, but on close examination we found it to be open and porous. If we could only see under this clay at harvest time it would astonish us to see the millions of feeding roots that have gone down through the clay and boulders and into the sand, for supplies of food and moisture.

And it would astonish all of us if we could see the roots of our growing crops in well tile drained lands. They would be found not only about, but in the tile (when the drain is not filled with water), doing their office work of furnishing supplies to the parent stem.

There are water-loving plants and roots of trees that are likely to stop the waterflow of a drain entirely. In one instance we saw two rods of a 3-inch tile drain taken up that was compactly filled with the roots of a large willow tree that grew twenty-five feet from the drain. In another instance we saw a tile drain filled with locust roots, and have learned of water elm and other water-loving trees that had caused the same trouble.

Mr. Parmly mentions that the depth of tile was eighteen inches, which we think a very shallow drain, and very liable to trouble from roots of growing crops. But when the crops are gathered or the crop changed, the roots decay and those in the tile are carried out with the waterflow, yet we greatly prefer that the drains should be from three to four feet deep, (more in some cases). Then the roots would have a deeper space to penetrate for food and moisture, and fewer of them would get into the tile, to decay and wash out after their work was done. The roots penetrating deep into the soil, and then, decaying, leave little openings or lung cells for breathing spaces. There is much more in the circulation of air through the soil and subsoils than we are likely to give credit for, until we have studied the office work of the air in the preparation of plant food and in furnishing supplies of moisture.

As to covering the joints of tile with cement to keep out the roots, we would not do it to keep out quicksand. A hard burned drain tile cemented at the joints will not only prevent the roots from entering but will keep out the water. As to quicksand, clay packed around the joints of the tile is the best to keep the sand out and at the same time admit the water. Tar or roofing paper cut into strips three inches wide and wrapped around the joints is good.

THE Decatur Leader Manufacturing Co., Decatur, Ill., manufacture a complete line of Clayworking Machinery for the manufacture of brick and tile. In connection they have facilities for making a thorough and reliable test of any clay sent to them for making tile or brick. The officers are Davis Brown, President; Elmore R. Frazier, Secretary; John A. Dawson, Treasurer.

Miscellaneous.

The Lightning Rod Dispenser.

A FARM BALLAD.

If the weary world is willing, I've a little word
to say
Of a lightning-rod dispenser that dropped down
on me one day,
With a poem in his motions, with a sermon in his
mien,
With hands as white as lillies, and a face uncom-
mon clean.
No wrinkle had his vestments, and his linen glist-
ened white,
And his new-constructed neck-tie was an interest-
ing sight,
Which I almost wish his razor had made red that
white-skinned throat,
And a new-constructed neck-tie had composed a
hangman's knot,
Ere he brought his sleek-trimmed carcass for my
women folks to see,
And his rip-saw tongue a buzzin' for to gouge a
gash in me.

But I couldn't help but like him—as I always
think I must.
The gold of my own doctrines in a fellow-heap of
dust;

When I fired my own opinions at this person,
round by round.

They drew an answering volley, of a very similar
sound;

I touched him on religion, and the hopes my heart
had known;

He said he'd had experiences quite similar of his
own.

I told him of the doubtin's that made dark my
early years;

He had laid awake till morning with the same old
breed of fears.

I told him of the rough path I hoped to heaven
to go;

He was on that very ladder, only just a round
below.

I told him of my visions of the sinfulness of gain,
He had seen the self-same picters, though not
quite so clear and plain.

Our politics was different, and at first he galled
and winced;

But I arg'd him so able, he was very soon con-
vinced.

And 'twas getting toward the middle of a hungry
summer day;

There was dinner on the table, and I asked him
would he stay?

And he sat down among us, everlasting trim and
neat,

And asked a short, crisp blessing, almost good
enough to eat;

Then he fired upon the mercies of our great
Eternal Friend,

And gave the Lord Almighty a good, first-class
recommend;

And for full an hour we listened to the sugar-
coated scamp,

Talking like a blessed angel—eating like a—blasted
tramp.

My wife, she liked the stranger, smiling on him
quite sweet;

(It always flatters women when their guests are on
the eat)

And he hinted that some ladies never lose their
early charms,

And kissed her latest baby, end received it in his
arms.

My sons and daughters liked him, for he had pro-
gressive views.

And chewed the quill of fancy, and gave down the
latest news;
And I couldn't help but like him, as I fear I
always must;
The gold of my own doctrines in a fellow-heap of
dust.

He was spreading desolation through a piece of
apple-pie,

And he paused and looked upon us with a tear in
his off eye,

And said—"Oh, happy family! your blessings
make me sad;

You call to mind the dear ones that in happier
days I had;

A wife sweet as this one; a babe as bright and
fair;

A little girl with ringlets, like that one over there.
I worshiped them too blindly! my eyes with love
were dim!

God took them to his own heart, and now I wor-
ship Him,

But had I not neglected the means within my way,
Then they might still be living, and loving me
to-day.

"One night there came a tempest; the thunder-
peals were dire;

The clouds that tramped above us were shooting
bolts of fire;

In my own house, I, lying, was thinking to my
own blame,

How little I guarded against those shafts of flame,
When crash! through roof and ceiling the deadly
lightning cleft,

And killed my wife and children, and only I was
left.

"Since that dread time I've wandered, and naught
for life have cared,

Save to save others' loved ones, whose lives have
yet been spared;

Since then it is my mission, where'er by sorrow
tossed,

To sell to virtuous people good lightning-rods—at
cost.

With sure and strong protection I'll clothe your
buildings o'er,

'Twill cost you fifty dollars, (perhaps a trifle
more),

What little else it comes to at lowest price I'll pu
(You signing this agreement to pay so much per
foot.)"

I signed it, while my family all approving stood
about,

And dropped a tear upon it—but it didn't blot it
out!

That very day with wagons came some men, both
great and small;

They climbed upon my buildings just as if they
owned 'em all;

They hacked 'em and they hewed 'em much
against my loud desires;

They trimmed 'em up with gewgaws, and they
bound 'em down with wires;

They trimmed 'em and they wired 'em and they
trimmed and wired 'em still,

And every precious minute kept a-running up the
bill.

My soft-spoken guest a-seeking, did I rave and rush
and run;

He was supping with a neighbor, just three mile
further on.

"Do you think," I fiercely shouted, "that I want
a mile o' wire

To save each separate hay cock out o' heaven's
consumin' fire?

Do you think to keep my buildin's safe from some
uncertain harm,

I'm goin' to deed you over all the balance of my
farm?"

He looked up quite astonished, with a face devoid
of guile,

And pointed to the contract with a reassuring
smile;

It was the first occasion that he disagreed with me! But he held me to that paper with a firmness sad to see; And for that thunder story, ere the rascal finally went, I paid two hundred dollars if I paid a single cent. And if any lightning rodder wants a dinner dialogue With the restaurant department of an enterprising dog, Let him set his mill a-runnin' just inside my outside gate, And I'll bet two hundred dollars that he won't have long to wait.

—Will Cartleton in *Chicago Farmers' Review*.

GOOD EVIDENCE

From Disinterested Witnesses Regarding Stewart's Diurnal Kiln.

We give the following quotations from letters in our possession.

"Altogether it is the best burn I ever had, with twenty-four years' experience. The tile are all well burned and none spoiled by the fire. I am very well pleased with the kiln. I know I can burn in one-third of the time formerly taken, with two-thirds of the fuel, and not one-tenth of the damaged tile."—B. F. Peck, East Bethany, N. Y.

"The kiln works nicely and good, and we want no better. It is all you claim for it.—O. Martin & Sons, Greene, Ind.

"Have burned one kiln; burned 30 hours; the top was very hard, but as far as we have emptied have found no warped or melted tile."—Ashberry Hinkle, burner for Miller Brown, Santa Fe, Ind.

"Have burned one kiln. I believe the kiln is all, or even more than you claim it to be."—J. C. Thackery, Urbana, Ohio.

"Have burned one kiln. Am very much pleased with it. The fact is, it could not be improved. Can scarcely tell by the looks of the tile what part of the kiln they came from—hard as flint. I burned longer than I expect to next time—was but a little more than half I gave my old kiln."—C. D. Rowe, Ridgetown, Ontario, Canada.

We add: Should any of our kilns burn the top too hard, restrict the draft

by shutting the doors closer. If too hard on the bottom, give more draft until the desired shade is obtained from top to bottom.

CANADIAN READERS

will bear in mind that we now have a patent on our kiln in Canada.

STEWART BROTHERS,
Mt. Victory, Ohio.

Passengers for the Eastern Cities, Thousand Islands, New York and New England River and Mountain retreats and Atlantic Coast Resorts, please bear in mind that the "Big Four" is the only direct route. Its celebrated Southwestern Limited, Special New York and New England Express, and Limited Boston are composed of the finest Vestibule Sleepers, Coaches, Cafe and Dining cars, and the schedule is so arranged as to bring passengers to their destination in the quickest possible time and at the most seasonable hours. The only line that lands passengers in the heart of New York City, giving passengers the privilege of stopping at Niagara Falls and a day-light ride on the beautiful Hudson River.

BIG "4" ROUTE.

Increased Accommodations for Passengers.

On and after Monday, July 13th, trains Nos. 2 and 3, between Indianapolis and Cincinnati and Indianapolis and LaFayette will have new and elegant parlor cars attached.

Lv. Indianapolis	10:55 a. m.
Arr. Cincinnati	3:00 p. m.
Lv. Cincinnati	1:10 p. m.
Arr. Indianapolis	5:00 p. m.

Lv. Indianapolis	3:15 p. m.
Arr. LaFayette	7:40 p. m.
Lv. LaFayette	8:00 a. m.
Arr. Indianapolis	10:45 a. m.



Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.22 pm. (daily.)
Ar Decatur	2.45 pm.	3.55 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.15 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accomodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin Bluffs, and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, JNO. S. LAZARUS, City Ticket Agent. General Fr't and Tkt Agt.



LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday	7:30 a. m.
Arrive in Chicago	2:30 p. m.
No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily	11:10 a. m.
Arrive in Chicago	5:00 p. m.
No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily	1:15 a. m.
Arrive in Chicago	7:35 a. m.
No. 18—Monon accommodation, daily	6:00 p. m.

LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday	11:55 p. m.
Arrive in Indianapolis	8:35 a. m.
No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily	9:55 a. m.
Arrive in Indianapolis	3:55 p. m.
No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily	9:30 p. m.
Arrive in Indianapolis	3:55 a. m.

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.
I. D. BALDWIN, D. P. A., Indianapolis.
JAS. BARKER, G. P. A., Chicago.

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Its trains enter the Central Union Station, CINCINNATI; the Union Depots, CLEVELAND, BUFFALO and ALBANY; the Grand Central, NEW YORK; the Boston and Albany, BOSTON; the Union Depot, ST. LOUIS; the Union Depot, PEORIA; the Great Central Depot, CHICAGO; the Union Station, INDIANAPOLIS, and numerous others in the vast territory it traverses between the MISSISSIPPI RIVER on the west; the OHIO RIVER on the south; the GREAT LAKES on the north, and the principal SEA-BOARD CITIES in the east.

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H. M. BRONSON, Ass't Gen'l Passenger Agent
Indianapolis, Ind.

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FOR SALE.

1 Ohio Tile Machine, size D.
1 Penfield No. 6.
1 Clay Crusher.
Address J. D. FATE,
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Two Brewer Tiffanies.
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One Ohio Tile Machine in good condition as new—dies from 2½ to 12 inches—a 25 horse-power Engine, and a 30 horse-power Boiler and a Feed Mill that will grind from 30 to 50 bushels per hour. Will sell the whole outfit cheap. For further information address
GEORGE L. BONNER.
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FOR LEASE.

Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap. F. C. DEVENDORF, Receiver,
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WANTED, SITUATION

As tile burner or engineer. Will give good references. Address, J. W. DERTHIC,
1 t. p. Rittman, Wayne Co., O.

The Perkins Wind Mill.



NO DOUBT

BUT

A Fact

The Perkins is the
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Mill now made.

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After 21 years of success in the manufacture of Wind Mills, we have lately made a complete change in our mill, all parts being built stronger and better proportioned and a self-lubricant bushing placed in all boxes to save the purchaser from climbing high towers to oil it. The same principles of self governing retained. Every part of the Mill fully WARRANTED and will run without making a noise.

The reputation gained by the Perkins Mill in the past has induced some unscrupulous persons to imitate the mill and even to take our NAME and apply it to an inferior mill. Be not deceived; none genuine unless stamped as below. We manufacture both Pumping and Geared Mills, Tanks, Pumps, etc., and General Wind Mill Supplies. Good Agents wanted. Send for catalogues and prices.

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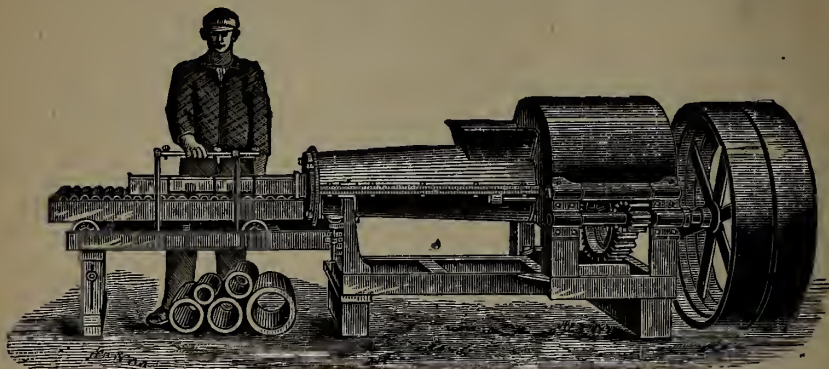


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Caution:—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

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Brick & and & Tile & Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

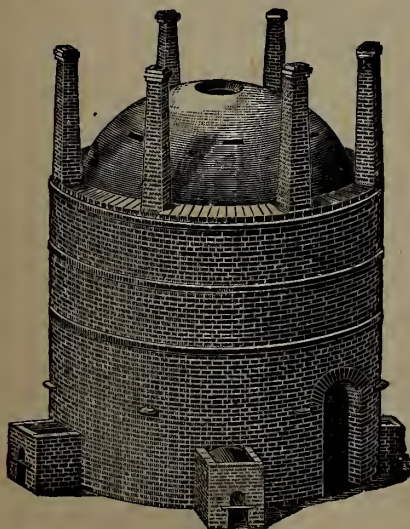
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. KELLS & SONS, Adrian, Mich.

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

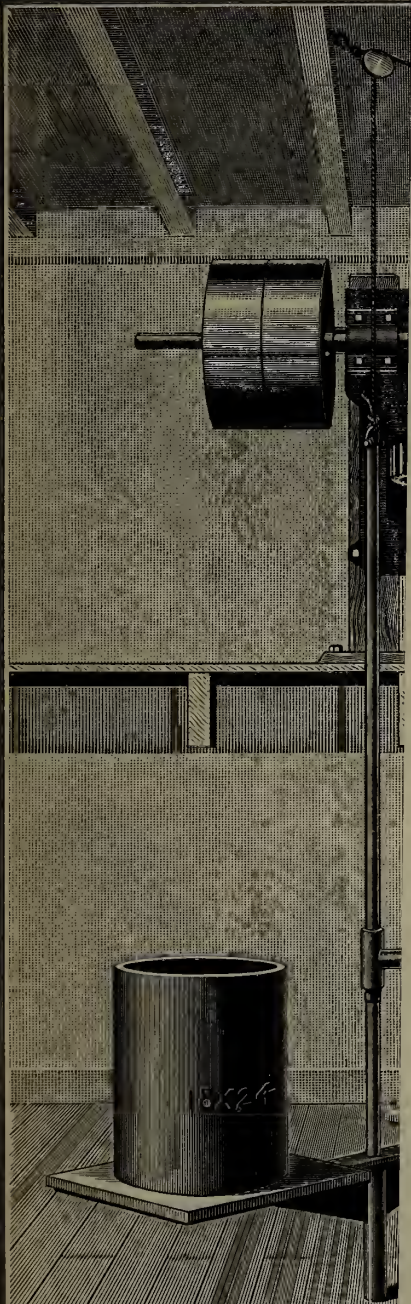
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

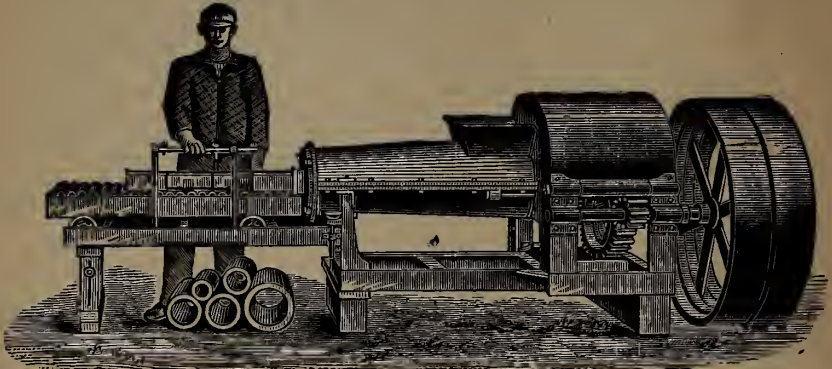
64 Johnson Building,

CINCINNATI, OHIO



W. C. L. S. 1885

KELLS & SON'S IMPROVED
Brick and Tile Machines!
"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

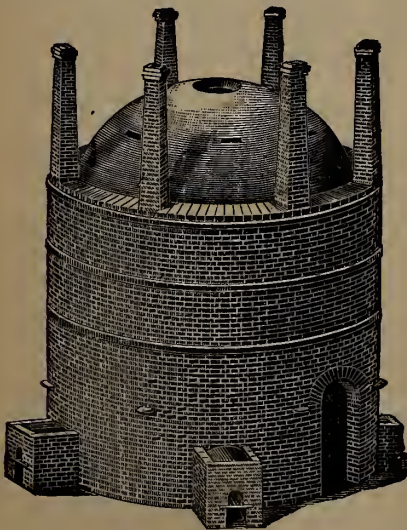
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. KELLS & SONS, Adrian, Mich.

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

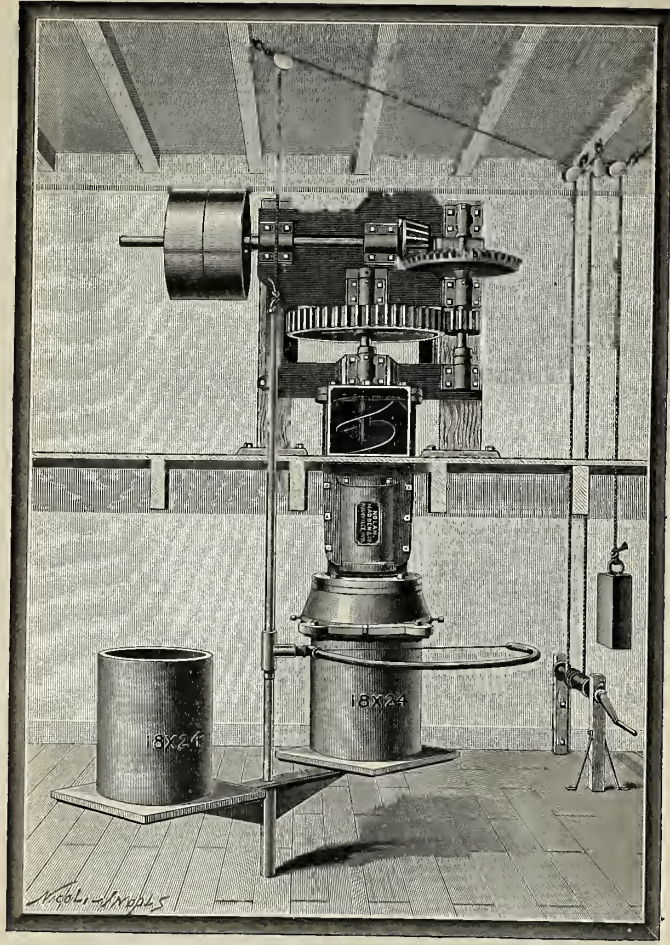
THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

W. A. EUDALY,

64 Johnson Building,

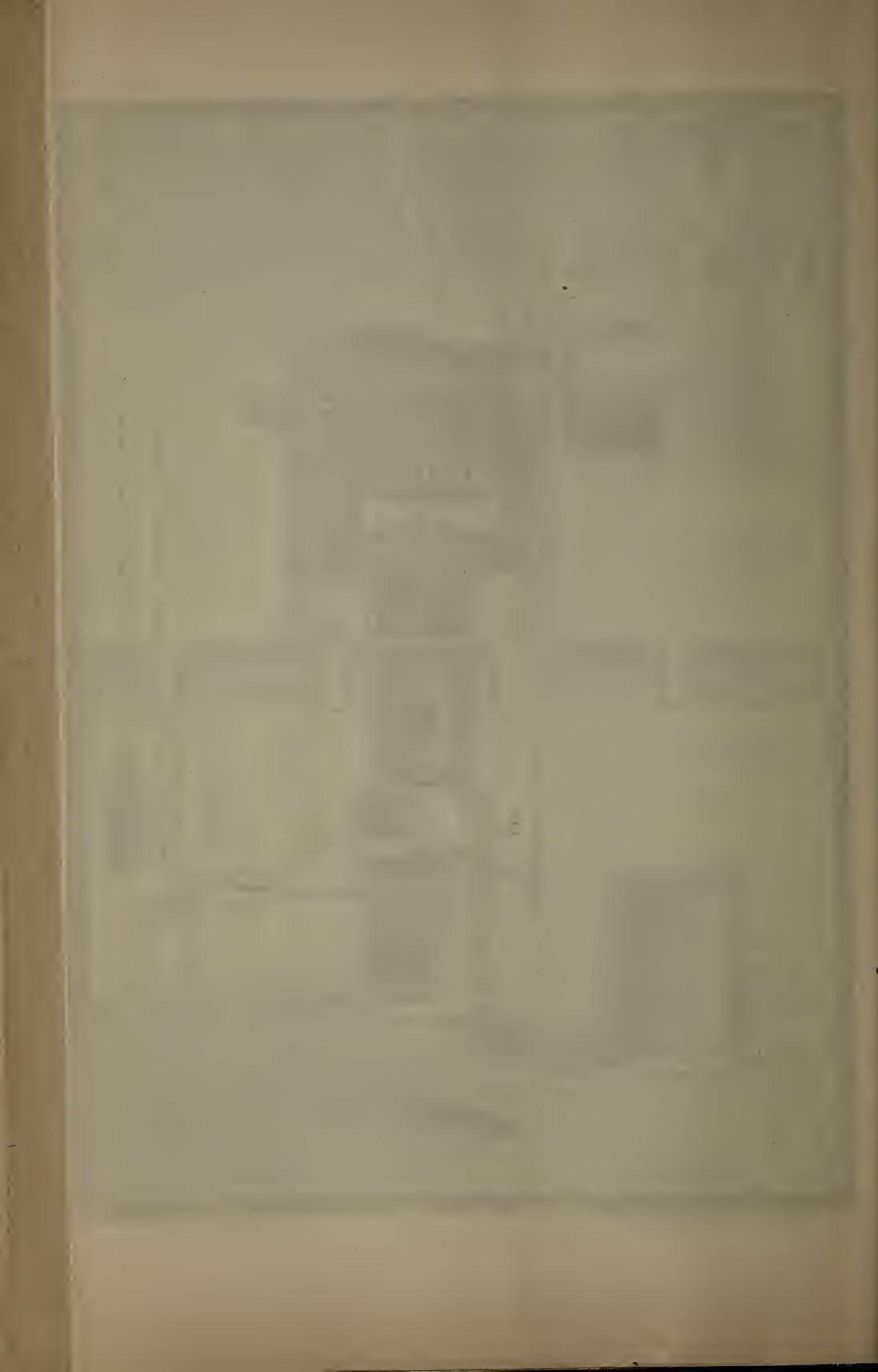
CINCINNATI, OHIO



NO. 10. NEW UPRIGHT TILE MACHINE.

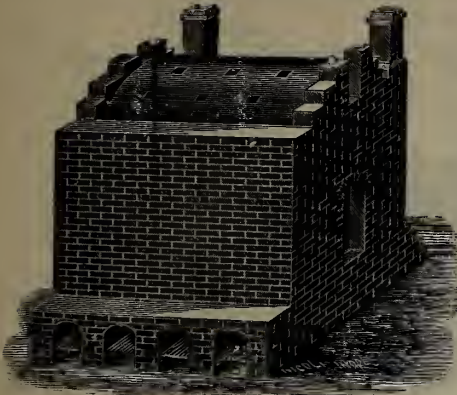
Our new Upright Tile Machine, for the manufacture of tile up to 18 inches, is intended to be used in factories where parties have machines for making small sizes. We are able to build it at such a price that anyone having a demand for large tile can afford to have one. Write us for prices.

NOLAN, MADDEN & CO.,
Rushville, Ind.



DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

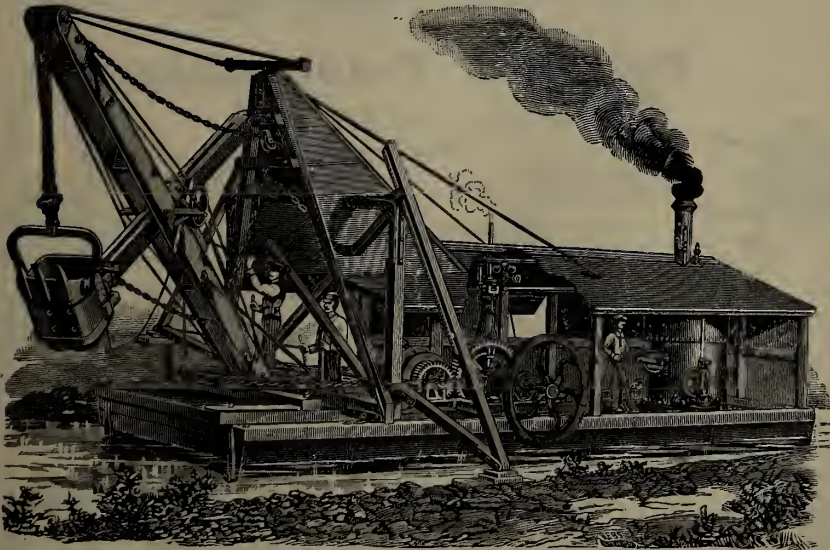
crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

W. E. DAWSON, Agent, Colfax, Ind.

The Dredge Ditcher.

For Constructing Large, Open Ditches.



Manufactured by

MARION STEAM SHOVEL CO.,

3

MARION, OHIO.

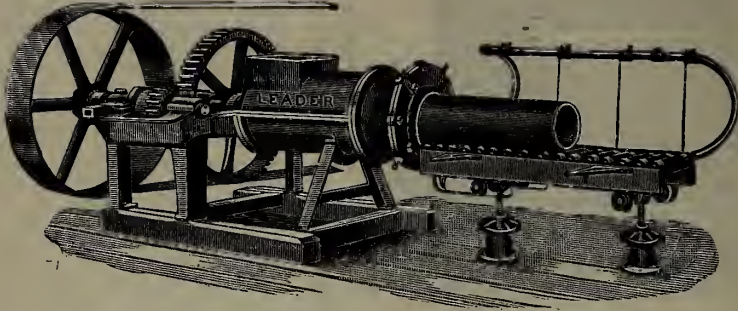
Advertisements.

The Decatur Leader Mfg. Co.,

DECATUR, ILLINOIS.

—MANUFACTURERS OF—

Clay Working Machinery.



THE LEADER BRICK & TILE MACHINE,

Model Clay Crushers, Reliable Clay Elevators.

Our Automatic Clay Car and Winding Drum the cheapest way to convey the clay to machine. Send for circulars.

ELEVATORS

FOR

CLAY, COAL,
ORES, SAND,
GRAIN,
ETC.



SECTION OF CONVEYOR.

ELEVATORS

FOR TILE,
BRICK,

PACKAGES, ETC.

Roller & Detachable

CHAIN BELTING,

Designed for

Elevators,

Conveyors,

Drive Belts,

—For Handling—

BRICK, CLAY, TILE, CLAY, ORES, ETC.

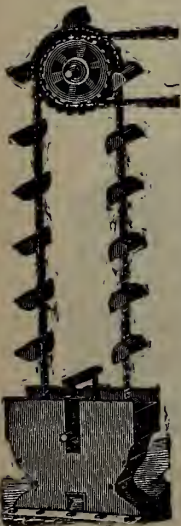
Estimates for handling material of any kind cheerfully furnished. For '91 Catalogue and prices

ADDRESS

The Jeffrey Manufacturing Co.,

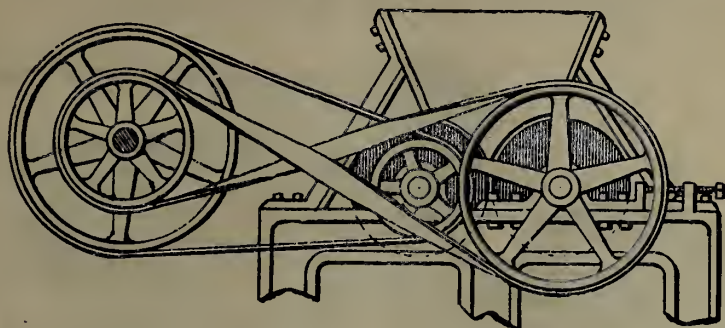
112 East First Avenue,

COLUMBUS, - - OHIO.



The Crusher, Disintegrator and Stone Separator

PATENT APPLIED FOR.



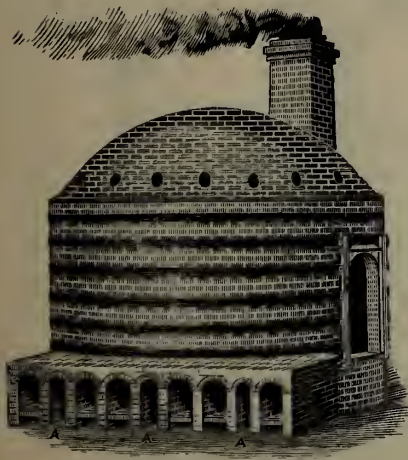
Every machine warranted. Satisfaction or no sale. Will work lumpy clay where other crushers fail. After a continued and thorough test, it is believed by those who are using it that the Crusher and Disintegrator as above illustrated is superior as a Crusher, as a Disintegrator and Stone Separator. Requires less power to run it. It is not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

THE BEST DOWN-DRAFT KILN.

PATENTED OCTOBER 14, 1890.



B. C. Wickers' Improved Down-draft Kiln
for burning tile, paving brick and
other clay goods.

This kiln is so constructed that the heat may be used in any part of the kiln so as to perfectly control the burning of the ware, and at the same time insure the greatest economy of fuel—either wood, coal or natural gas.

The construction is so simple that inexperienced persons may burn it successfully after witnessing the burning of one kiln of ware; and may at any time during the process of burning, regulate the heat so as to burn the ware perfectly from top to bottom, and from side to side, insuring the most satisfactory results.

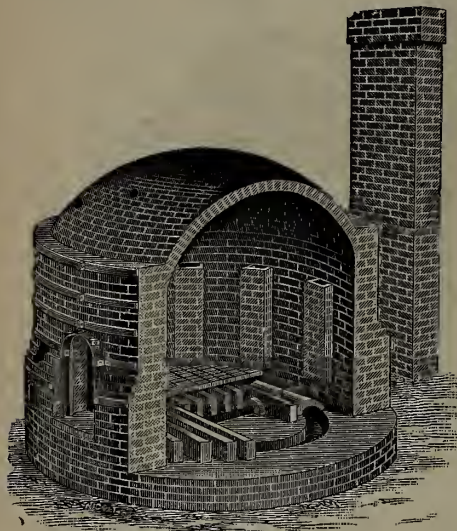
For circulars and further information, apply to or address

B. C. WICKERS,

LEBANON, IND.

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT→LEADS→THE→WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,

CHENOA, ILL.

The "Grawcock"

→New and Improved Brick and Tile Kiln←

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tilemakers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

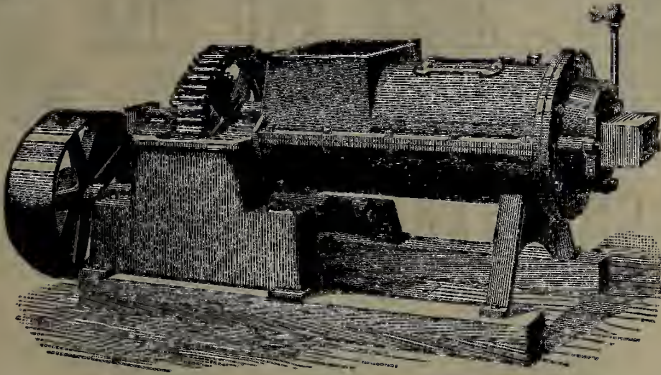
This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly urned ware. Kiln rights for sale. For information, address



J. B. GRAWCOCK, Churubusco, Ind.

TIFFANY IRON WORKS, Tecumseh, Mich.



THE NEW CENTENNIAL

MAKES THE BEST

BUILDING BRICK, PAVING BRICK and FIRE BRICK.

CAPACITY FROM 20,000 TO 40,000.

No Seams or Laminations.

HOLLOW BRICK,

ORNAMENTAL BRICK,

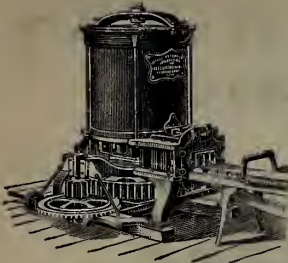
ALL SHAPES OF BRICK AND TILE.

Our No. 1 Pug Mill.



PLANS AND ENTIRE PLANTS OF MACHINERY FURNISHED.

NEW AND SUPERIOR DESIGNS IN CLAYWORKING MACHINES.



(No. 7 S Brick and Tile Machine.)



(No. 2 E h.p. Machine.)

PENFIELD BRICK AND TILE MACHINERY.

CLAY CRUSHERS, PUG MILLS AND ELEVATORS,

Dry Cars ;

Clay Cars ;

Turn

Tables

and

Kiln

Castings.



Pulleys ;

Shafting ;

Hangers ;

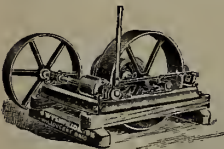
Barrows

and

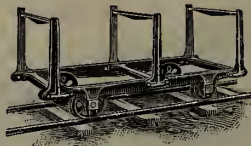
Yard

Supplies.

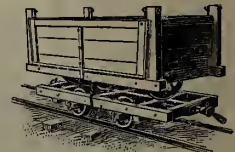
COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



(Dry Car.)



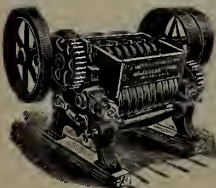
(Clay Car.)

J. W. PENFIELD & SON,

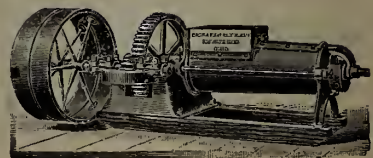
Willoughby,

Ohio,

U. S. A.



(No. 2 Crusher.)

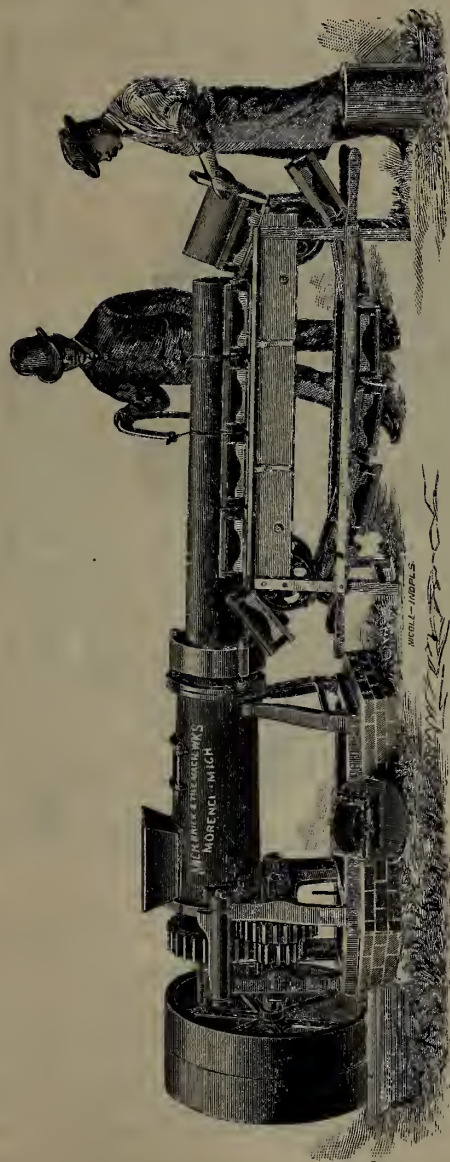


(No. 7 Pug Mill.)

MICHIGAN BRICK AND TILE MACHINE CO.

JAMES F. CLARK, PRESIDENT.

JOHN H. CAMPBELL, SEC. AND TREAS.



No. 1 Brick and Tile Machine.

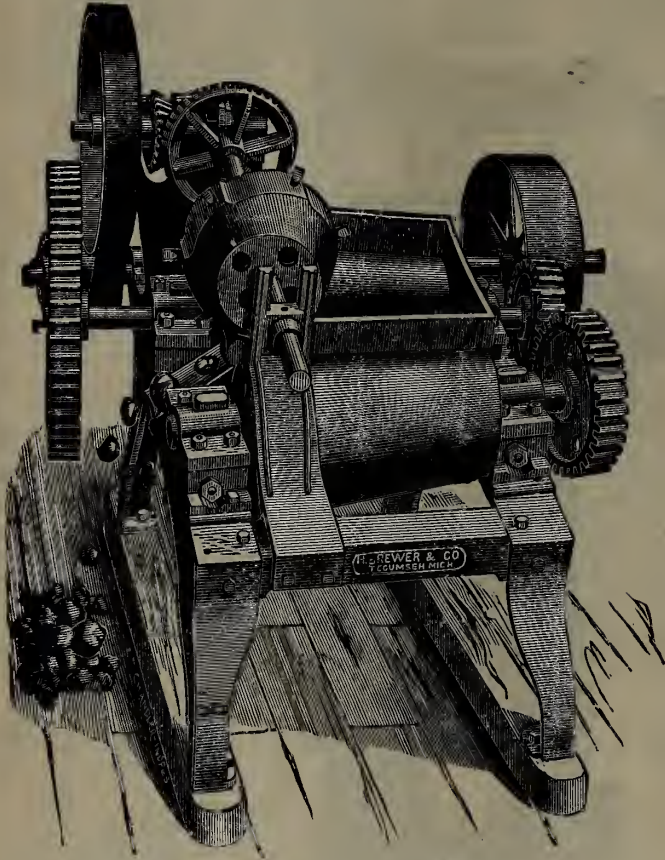
With increased facilities and many years' of experience in the use and manufacture of clayworking machinery, we believe that we can fully meet the wants of the trade.

We shall make a specialty of furnishing complete outfits, plans of yards, buildings, etc., the latter are free to our customers.

We warrant our Patent Curved Cut to make absolutely straight brick. Our machines are not excelled for speed in working or for durability. Write us for descriptive circulars and prices. Address

MICHIGAN BRICK AND TILE MACHINE CO.,
Morenci, Mich.

H. BREWER & CO., Clay Crusher and Stone Separator!



The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

PATENTED MARCH 3, 1885.

ADVANTAGES:

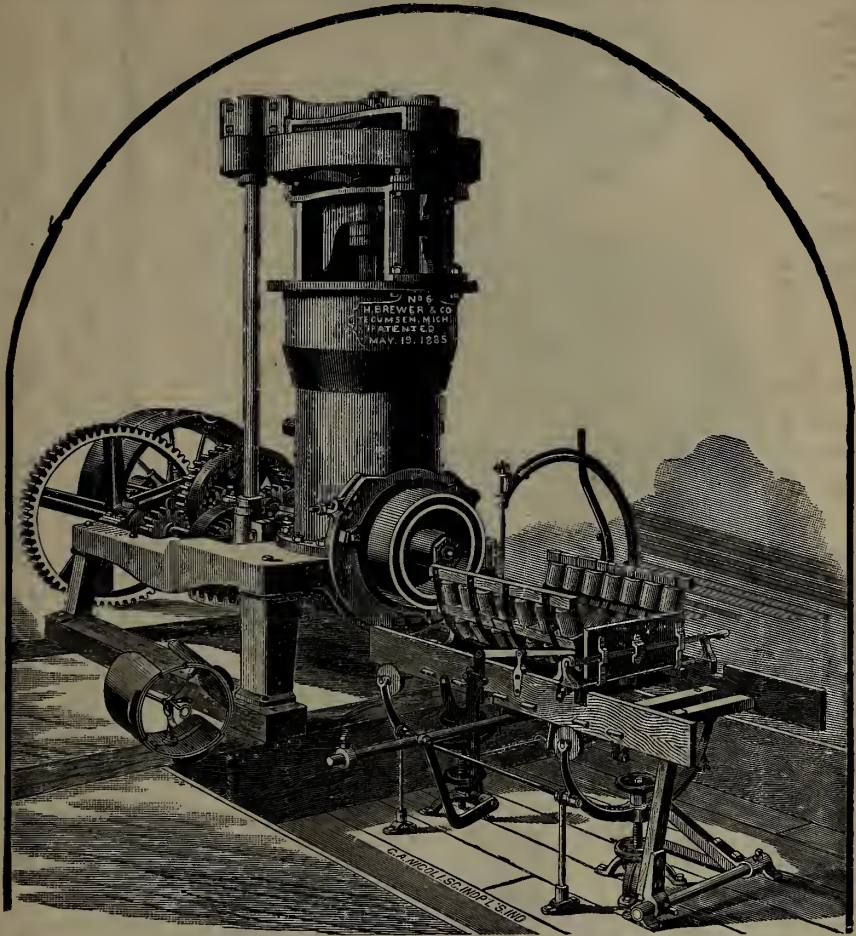
The following are among the advantages claimed for this form of construction:

- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Yours Truly, M. J. LEE.

Joliet, Ills., March 28, 1888.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

Yours Truly,

JOLIET MOUND DRAIN TILE CO.

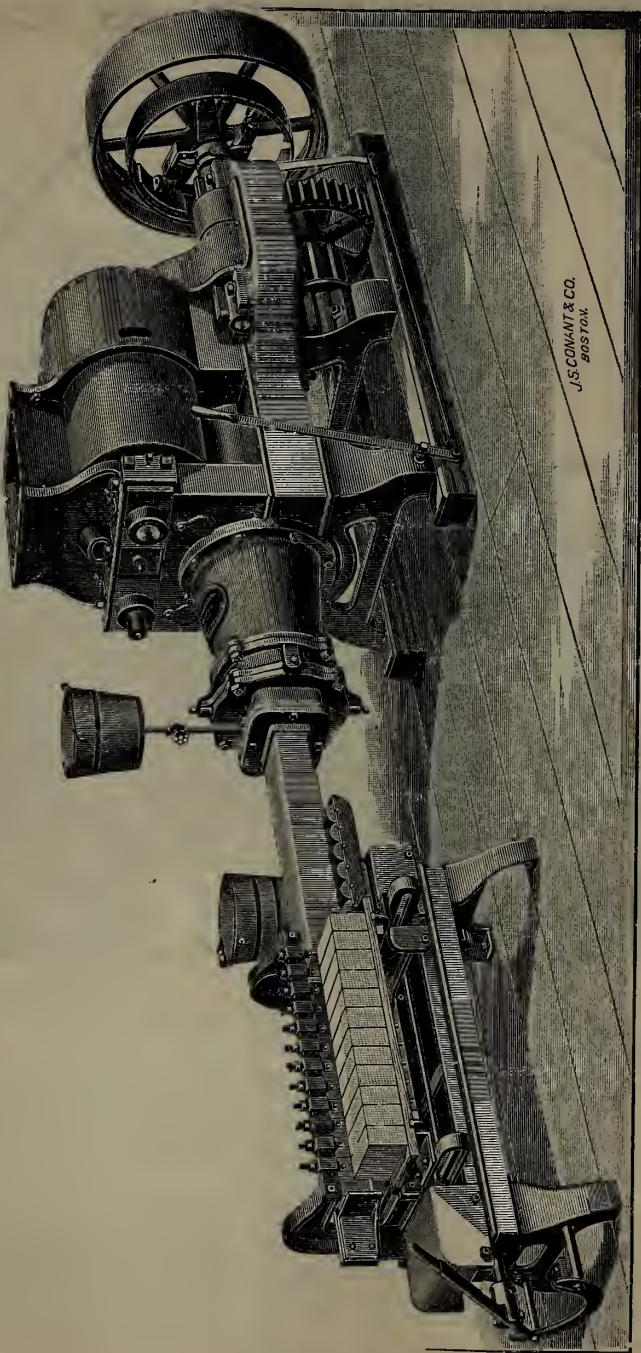
The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



"A" or Largest Size Machine with New Board Delivery Cutting Table.

Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

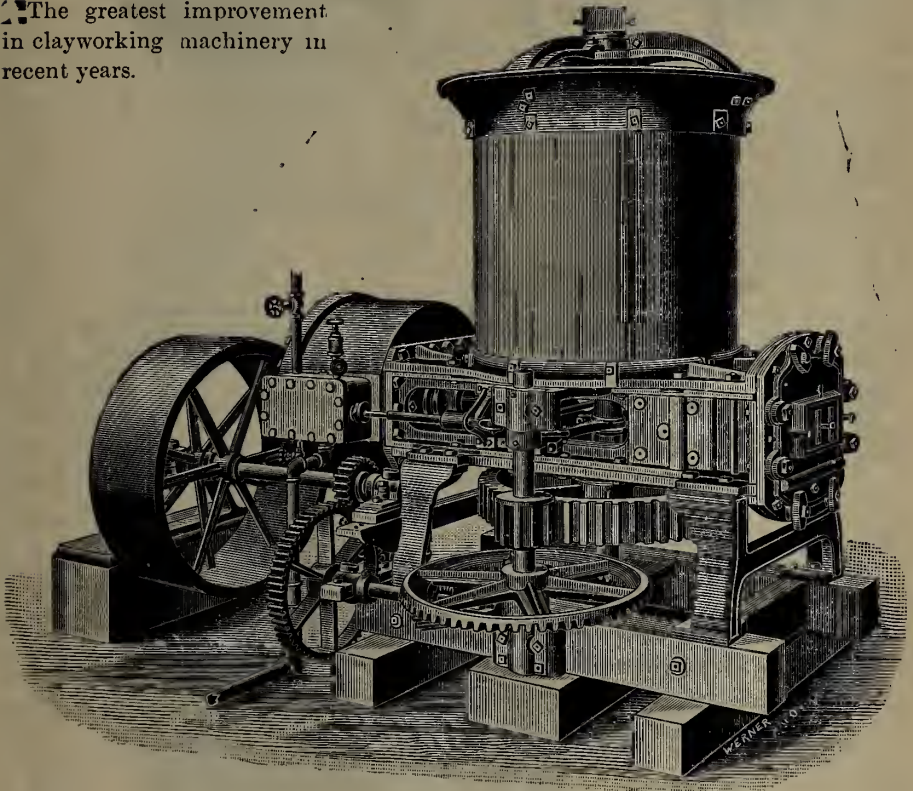
E. M. FRIESE & CO.,

Mention this paper.

PLYMOUTH, Richland County, OHIO.

The Titus Steam Press Tile and Brick Machine.

■ The greatest improvement
in clayworking machinery in
recent years.



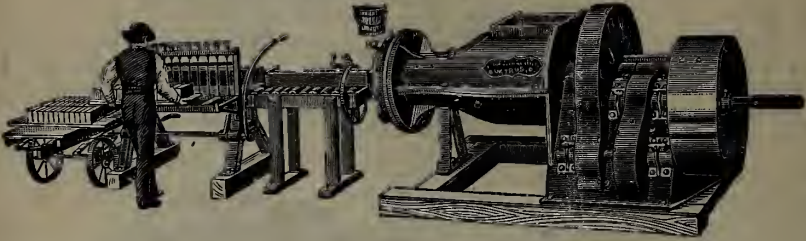
PATENTED APRIL 14, 1891.

For full information and circulars address

THE NEW BREMEN MACHINE CO.,
New Bremen, Ohio.

FREY--SHECKLER CO.

BUCYRUS, OHIO.

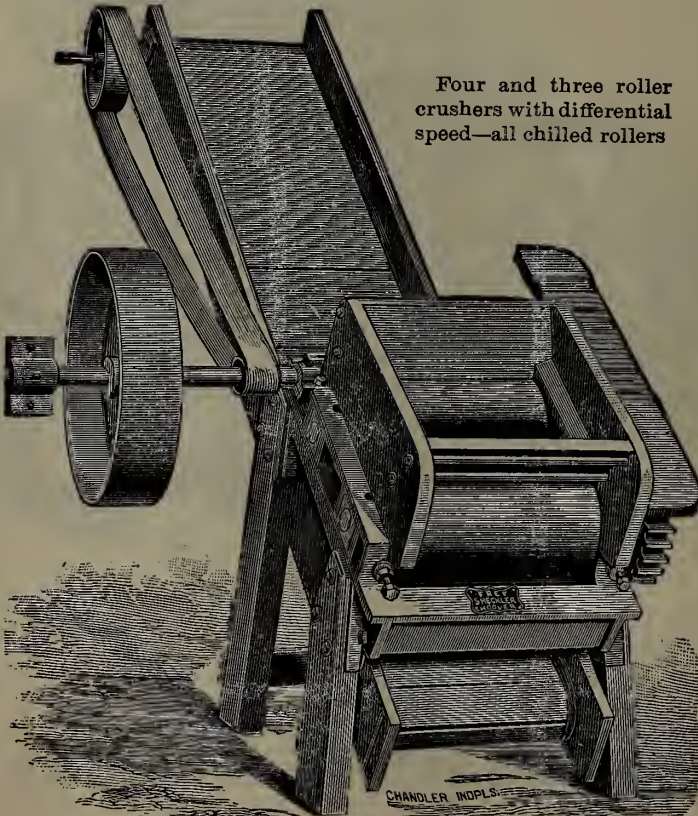


The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.

The Mascot—the lightest running.

The Centennial—the best clay mixer.

We furnish full outfits for brick and tile factories.



Four and three roller
crushers with differential
speed—all chilled rollers

Six Different Brick Machines; Four Different Tile Machines
Crushers, Represses, Kiln Doors, Kiln Irons, Grates,
Brick Moulds, Steam Pipes, Brass Goods, Etc.

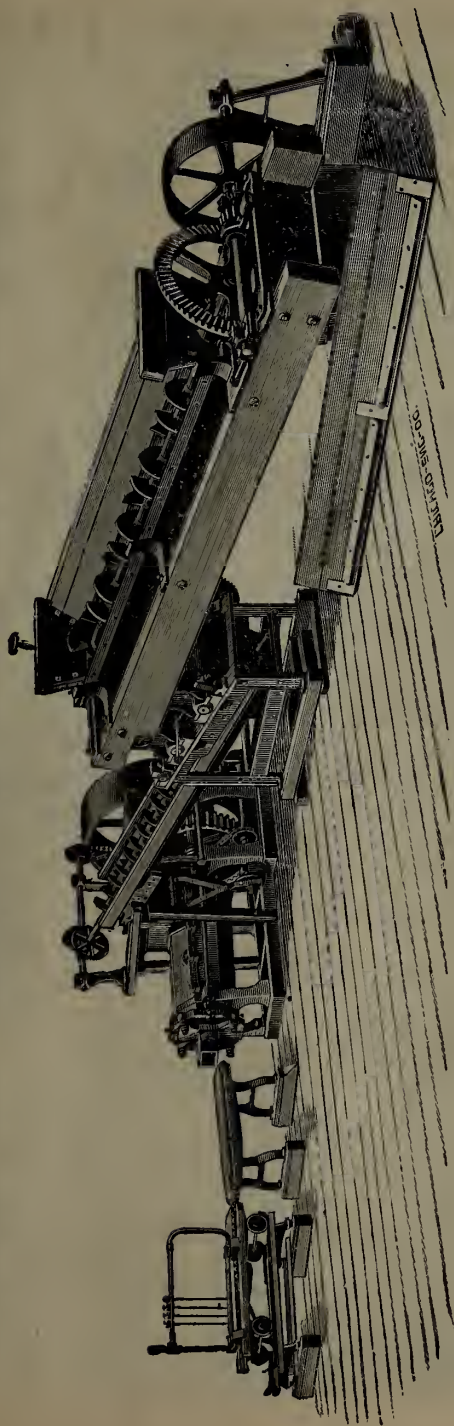
Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.

We make thirteen different patterns of Roller Clay Crushers.

Send for catalogues and circulars to

THE FREY-SHECKLER CO., - Bucyrus, Ohio, U.S.A.

BRICK AND TILE MACHINERY.

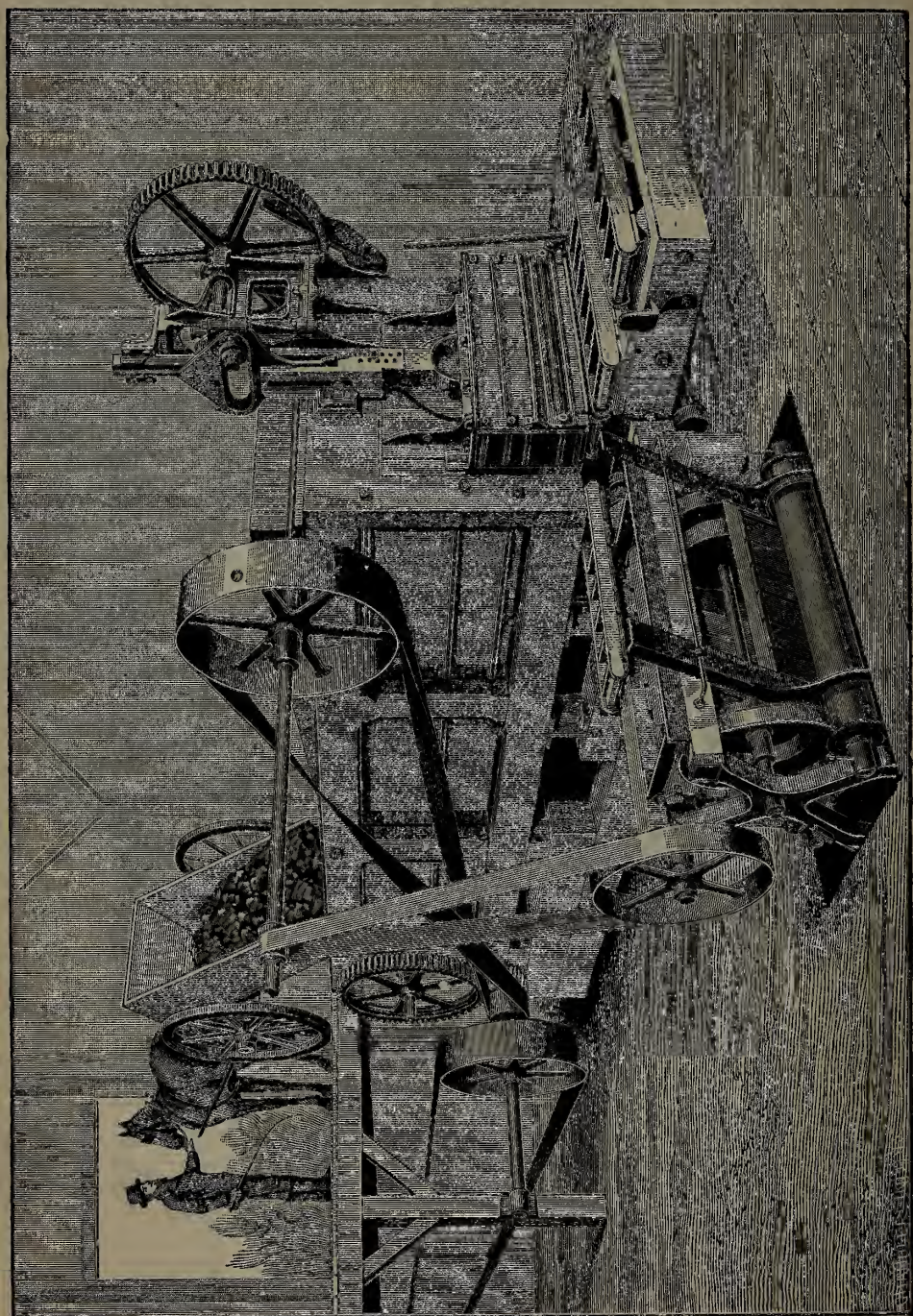


New Machinery, new Clay Conveyor, new Automatic Cutting Table, specially adapted to cutting paving brick.

Write for Catalogue and information. Address

Adrian Brick & Tile Machine Co.,
ADRIAN, MICH.

Advertisement.



The Potts Horizontal Stock Brick Machine.

Requires no extra Pug Mill to work the clay direct from the bank.

It has the largest tempering capacity of any machine on the market.

All brick made have clean, smooth surfaces and sharp corners.

It works the clay stiff enough to make the finest Stock Brick.

Our Mould Sauder, shown in cut, has taken the lead of all machines for this purpose. There is no place for the moulds to catch and cause delays. It will not spill or waste any sand. It is easily and quickly adjusted to any size mould.

NOTICE:—A. H. Newton, of Cohoes, N. Y., claim our machine is an infringement on patent owned by them, and that persons using our machines will be prosecuted. As to this we would say, that we do not infringe said patents; that we have put our machines on the market only after a careful investigation to ascertain exactly what our rights are in the premises, and, being fully satisfied of our rights, we are prepared to protect our customers and Patents No. 397,274, of Feb. 5, 1889.

We are prepared to erect complete plants of any desired capacity and keep in stock a full line of **Brick Machines, Pug Mills, Disintegrators, Mould Sanders, Clay Cars and Drums.**

It will pay you to write us for prices.

C. & A. POTTS & CO.,

Write for 1891 Catalogue—Just Out.

INDIANAPOLIS, INDIANA

NEW DEPARTURE TILE MACHINE

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

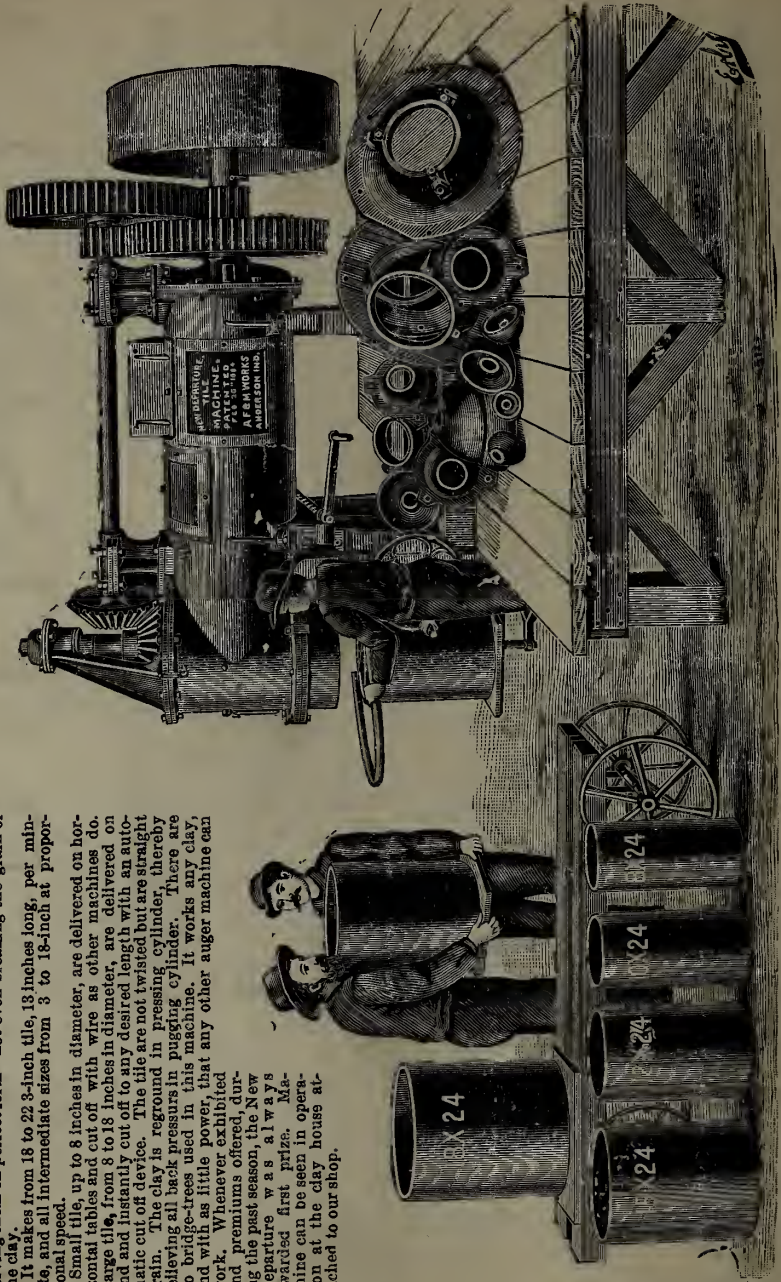
It makes from 18 to 22 3-inch tile, 13 inches long, per minute, and all intermediate sizes from 3 to 18-inch at proportional speed.

Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressures in pugging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power, that any other auger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be seen in operation at the clay house attached to our shop.

For full information and circulars, address:—

ANDERSON FOUNDRY & MACHINE WORKS,

Anderson, Ind.



TRANSIT LEVEL

FOR THE USE OF

ARCHITECTS AND
BUILDERS.



FIG. 11.

My DAISY LEVEL patented April 22, 1884, is the Cheapest Level made with the same accuracy for drainage purposes.

T. F. RANDOLPH,
Surveyors' and Engineers' Instruments,

51 West Fourth Street, Room 31.

CINCINNATI, OHIO.

This is a new, light and convenient instrument for leveling and taking horizontal angles without the Magnetic Needle attachment, intended for architects and builders uses.

The main plates of the instrument are supplied with two Cross Levels for leveling the instrument.

The Limb or Circle is $4\frac{1}{2}$ inches in diameter and divided in five degrees with a vernier reading to $\frac{1}{2}$ degrees. (The dividing of the limb can be made to read to single minutes if desired.)

The Telescope is $7\frac{1}{2}$ inches long, and the attachment is very accurate. The Level is adjusted so as to level either direction from where the instrument stands.

The Telescope being made to transit will also give the plumb line of a structure. "All boxed in Sole Leather Box." This, I believe, is the most desirable instrument made for the purpose for which it is intended and at a low price.

Price, as shown in the cut with 5 ounce plumb, \$50.00.

With a more complete tripod, as shown in Figures 2 and $2\frac{1}{2}$ in my catalogue, the price would be \$60.00.

Send for Catalogue.

THE WALLACE MANUFACTURING CO., Frankfort, Ind., U.S.A.

"LITTLE WONDER."

—MANUFACTURERS OF—

LITTLE WONDER TERRA
COTTA LUMBER, BRICK
AND TILE MACHINE.

WALLACE PATENT CLAY
CRUSHERS AND STONE
SEPARATORS.

WALLACE PATENT PUG
MILLS.

PLATFORM SPRING BAR-
ROWS FOR BRICK AND
TILE AND A FULL LINE
OF CLAY WORKERS'
SUPPLIES.

CORRESPONDENCE SOLICITED



PER COPY.
\$1.00 PER YEAR.

THE DRAINAGE JOURNAL

OCTOBER, 1891.

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FARM DRAINAGE,
WATER OF DRAIN TILE,
PROGRESSIVE AGRICULTURE
IMPROVEMENT OF HIGHWAYS.

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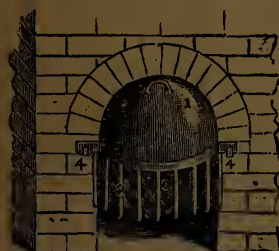
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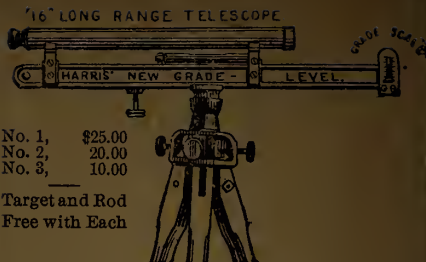
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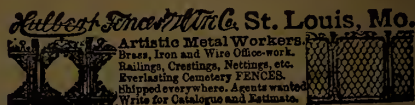
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THE DRAINAGE JOURNAL

Vol. XIII. OCTOBER. No. 10.

DRAINAGE EXPERIMENTS.

BY S. A. BEACH, B. S. A.

A series of drainage experiments was inaugurated last fall intended to cover several years, the object being to compare crops produced on drained and undrained land; also to compare the merits of deep and shallow drainage on soil underlain at a depth varying from ten inches to two feet with hard tenacious clay.

For this purpose equal areas of drained and undrained soil, otherwise similar were prepared alike, planted to the same crop and given exactly similar cultivation.

A comparison is made of time of ripening, quality and quantity of yield.

The first year's work is not yet complete but it is believed a report of the progress of this experiment will be of interest especially to gardeners, fruit growers and others who believe in intensive rather than extensive cultivation.

The ground selected for this experiment has a uniform slope to the north of about 5 inches to the rod, at the foot of which is the main drain of 3 inch tile. The soil is rather heavy clay loam under-laid with hard-pan at a depth varying from 10 inches to two feet. From the main drain laterals were extended up the slope for a distance of twenty rods. These laterals were placed

a rod apart and at varying depths. The first three were laid four feet deep. The next two were laid twenty inches deep. The next two were laid two and a half feet deep.

For cost of tiling at different depths see table.

During the present season this land was occupied by Irish potatoes, strawberries and cabbage.

TABLE SHOWING COST OF DRAINAGE.

Depth 2½ feet:		
To digging 40 rods.....	\$18.50	
To cost of tile.....	18.48	
To laying tile.....	2.00	
To covering tile.....	5.50	\$ 44.78
Av. cost per rod 2½ feet deep.....		\$ 1.12
Depth 20 inches:		
To digging 40 rods.....	\$10.00	
To cost of tile.....	18.48	
To laying tile.....	2.00	
To covering tile.....	4.78	\$ 35.26
Av. cost per rod 20 inches deep...		\$ 0.88
Depth 4 feet:		
To digging 60 rods.....	\$85.95	
To cost of tile.....	27.72	
To laying tile.....	3.00	
To covering tile.....	13.92	\$130.59
Av. cost per rod 4 feet deep.....		\$ 2.17

IRISH POTATOES.

The variety selected for this test was the Early Rose with which a certain area of tile drained land was planted and the remaining part of the same lot of potatoes was planted in an undrained field of similar soil. The two pieces of land were previously manured alike and were given the same care and cultivation.

In the undrained field on May 31 an area was selected equal to the area

planted on the tiled land and the potatoes were dug. The yield was 3.75 bushels. Three days later the potatoes on the tiled land were dug. The yield 10.25 bushels. The apparent increase in yield from tile drainage thus being over 170 per cent. There was also great superiority in size, appearance and quality of the yield on the drained land.

CABBAGE.

The experiment with this vegetable was conducted in a manner entirely similar to that with the Irish potato and gave even more marked results. Similar soil on tiled and untiled land was selected, manured the same and set to the same varieties of Early cabbage. The heads began to mature on the tiled plat about a month earlier than on the untiled plat. In fact at present writing (June 15) it is difficult to find enough matured heads to make comparison of average weight. Six have, however, been gathered. Their average weight is 1.58 pounds. The tiled plat has matured 342 heads, having an average weight of 2.24 pounds, thus showing a remarkable advantage in time of ripening and increase in size of cabbage on the tiled ground.—*Texas Agriculture Experiment Station.*

A BIG IRRIGATION CANAL.

The greatest irrigation enterprise ever projected for Nebraska is the Belmont and Froid canal, in the North Platte river counties west of and including Deuel county. As originally conceived it was to be 250 miles long, water 685,000 acres and cost \$3,750,000. It has recently been decided, however, to divide it into two sections, the first of which will be begun this spring. This canal will be about 100 miles long and will extend through Scott's Bluff and Banner counties.

Farm Drainage.



TILE DRAINAGE.

Will it pay to underdrain all kinds of soil? is a question frequently asked by those who have had no experience in draining land. We answer that there are soils that do not need any additional underdrainage. Sandy soils, underlaid with gravel or sand, are already underdrained. Clay soils having a strata of sand and gravel within four or five feet of the surface, which take up the water that passes down through the soil and subsoil and carries it away so as to prevent any damage to the growing crop, are effectually underdrained. Soils that are light, admitting the excess of water readily to pass down out of the reach of the roots of our crops do not need underdrainage.

Soils that need underdrainage are those that retain an excess of water to the serious detriment of the growing crops. All close retentive soils, rich in the elements of fertility, not underdrained by some natural provision, need underdrainage.

Soils having an undulating surface, and valuable for agricultural purposes,

but liable to surface washing, are especially benefited by underdrainage, which prevents, to a large extent, the loss of fertility occasioned by surface washing.

Wet clay soils are greatly benefited by underdrainage. Thousands of acres of our most valuable lands, for agricultural purposes, have been made so by underdrainage.

There are few farms, having clay soils, that would not be benefited more or less by being underdrained, in part, at least.

Land owners are not easily convinced, that it will pay to tile drain rolling lands, but the few who have tried it have been pleased with the results obtained from such improvement—of the mechanical condition of the soil, both as to the saving of fertility and the universal yield of the crops.

There are millions of acres of land in this country that have as yet received no attention in the way of underdrainage that would pay well to thoroughly tile drain.

HOW TO TILE DRAIN.

A matter of first importance is a free and full outlet for the water. If this cannot be obtained on owner's land, then secure it by some arrangement with owners of adjoining lands. If the outlet is not sufficient the system will be faulty. If the outlet is not free, then the water will back up in the tile and fail to drain the land near the pipe thus filled with water. The water that is in the soil enters the drain through the joints of the tile. If the water in the drain is much below the water level in the soil the soil will not be freed from the excess of water until the water level in the soil is brought to a level with the drain in some way; if by slow percolation through the clay beneath the drain, then little benefit can be expected to the land thus effected by the backwater.

FIRST A GOOD OUTLET.

Having determined where the outlet is to be, then proceed to lay out the main drain, avoiding, so far as possible, any angles or curves; and follow, so far as possible, the natural drainage of the land.

Tile drains laid in straight lines have a greater capacity, for the reason that there is less obstruction to the flow of the water.

The tile in the main drain should be large enough to receive the water flowing into it from the lateral drains. Where the fall or inclination is as much as one inch to the rod, and the main is expected to receive the water of twenty acres of land, the size of the tile should be as much as six inches at the outlet and reduced in size in proportion as the lateral drains entering into it have been passed. Where the fall is greater, the size of the main may be less. But it is better to use sizes of tile larger than necessary rather than sizes too small. Much depends, however, upon the directness of the line, the regularity of the fall, and the laying of the tile evenly together at the joints.

It is frequently the case that it is not possible to lay straight drains, then the circumstances must govern the laying approximating the general principle as near as practicable. In such cases, the curves should be gradual, so as to give the least possible resistance to the flow of water.

The lateral, or side drains, entering into the main drain should enter at an acute angle, so as to interfere with the flow of water in the main drain as little as possible.

At the junctions of the drains, the connections are best made with junction tile made for that purpose. Tile factories can usually supply them. Where such tile cannot be had the straight tile

may be cut so as to form the junction. Broken pieces of tile may be used to advantage in constructing junctions; they should be from large sizes of tile, and laid so as to cover any opening at the junction joints.

It is often the case that the area to be underdrained has a regular inclination, so that there is no need of one general outlet but each line of tile drain has its outlet. Then the drains may be laid parallel, 40, 50, 60 or more feet apart, depending upon the character of the soil and subsoil. Where the fall is very slight it is better to secure the services of a skilled drainage engineer, to determine the fall and the lines of drains necessary to make the system complete. There is often a saving in the sizes of tile designated by a competent engineer and in the better character of the work done, to more than pay the extra expense.

Where there is a sufficient flow of water from the subsoil, and the services of an engineer cannot be had, the work may be done by closely observing the current of water flowing in the drain, and the careful laying of the tile, avoiding depressions or elevations in the line of tile. A regular flow of water from head to outlet should be secured, if at all practicable.

DEPTH OF DRAINS.

As to depth of drains much depends upon the outlet secured, the fall, the character of the surface soil and subsoil. Where the outlet is sufficient and the fall one or more inches to the rod, and the subsoil rich in the elements of plant food, only needing the action of the air and the increased porosity resulting from underdrainage to largely increase the productiveness of the land, then we would advise the laying of the mains as deep as four feet, and the laterals three and a half feet. But if the depth of out-

let is much less and the fall very slight, then we advise a less depth. However, there are areas of land so level as to have little or no inclination. Suppose that two feet is all that can be had for an outlet, then we advise drainage if the land will be valuable for agricultural purposes when drained.

A drain having a shallow outlet and the drain laid level (with care) will drain the soil through which it passes, to that depth. It will not drain so wide on each side of the drain, nor so deep, but the water will flow out through the outlet from the pressure of the water in the soil above the line of the drain.

It is often better to drain to the depth of two feet than not to drain at all. We do, however, advise deeper drainage than has been usually practiced. Deeper drainage means deeper soil, a better condition of the soil, and larger crops.

We know by close observation that much of the drainage that has been done, has been so shallow and imperfectly done as to be almost a useless expenditure of labor and money.

The deeper the tile are laid (we do not mean an unreasonable depth) the more effective will be the working of the drains, if well laid. The soil and subsoil made porous by underdrainage will allow the water of a heavy rainfall to pass down to a depth that will do no harm to the growing crop. Smaller tile may be used in deep drainage than in shallow. The tile in shallow drains being near the surface need to be large to pass the water away rapidly so as not to injure the crop. However, we think it better to use tile of sufficient size to allow a free passage of air through the drains, and thus secure a better circulation of air through the soil.

WIDTH OF DRAINS APART.

To thoroughly underdrain, the lines of tile drains should be no greater dis-

tance apart than will drain the soil lying between. In a close, retentive clay soil, fifty feet apart, will probably be close enough. In a vegetable loam soil the distance may be greater, probably seventy-five feet. In an open soil and subsoil, and at a depth of three and a half feet, the drains may be laid a hundred feet apart and do good work. The depth of the drains has much to do with the distance apart, the deeper drainage admitting of the greater distance.

SIZES OF TILE.

The following sizes are designated to drain the area named. For ten acres, through one outlet, use at the outlet and for a distance above, a 5-inch tile; for twenty acres a 6-inch, for forty acres an 8-inch.

The larger the tile the more rapid will be the velocity of the water, and the greater the fall the greater the velocity of the water. Where the fall is two inches to the rod much smaller sizes of tile may be sufficient, but we designate the larger sizes having in view the better aeration of the soil.

Sizes of tile should be diminished as the upper end of the drain is approached.

HOW TO LAY THE TILE.

After determining and staking out the lines of the drain, if it is intended to do the work with a ditching spade, stretch a cord, two or three rods in length, on one side of the intended drain, to enable the ditcher to dig the ditch straight. With a common spade remove one spade in depth, following with a long handled shovel, remove the fine earth left in the bottom and pare off the high places, making the bottom of the first spade in depth removed as near level as possible, then follow with a tile spade 16 inches or 18 inches in length, removing with a narrow scoop

shovel the fine earth at the bottom, and finish with another depth of the tile spade, scooping the bottom until the fall is regular.

A common spade will remove ten inches, which, followed with two depths of the ditching spade will make a depth of forty or more inches, depending upon the slant of the spades operated.

Make the ditch as narrow as the ditcher can work in it and no larger at the bottom than is sufficient to receive the tile and rounding in the bottom if round tile are to be laid. There are tile scoops made especially for the purpose of making the bottom of the drain so curved as to receive the size of tile to be used.

LAYING THE TILE.

Begin at the outlet and lay each tile in direct line with the one already laid, shouldering the tile so as to have a smooth waterway inside. Care should be especially given to this part of the work. Place the ends of the tile as close together as possible. If the joint is open on one side turn the tile so as to secure the best fitting joint possible. Have no fear as to the waters not getting into the drain. We assure you that there will be no trouble in this particular. The close joints will keep out the silt. If quicksand is encountered cover the joints with clay—there is nothing better. By all means secure a regular fall; do not allow any ups and downs in the drain.

After laying the tile, place a shovel or two of earth on each joint of tile, securing the tile to their place, then fill the drain as rapidly with the loose earth as is convenient, with plows or scrapers, or any device to expedite the work.

Other hints in tile drainage will make a chapter for the next number of the JOURNAL.

B.

WATER, AIR AND HEAT IN THE SOIL.

Prof. Johnson in his "How Crops Feed" says: "Water, whose excess or deficiency is as pernicious as its proper quantity is beneficial to crops, enters the plant almost exclusively through the roots, and hence those qualities of the soil which are most favorable to a due supply of this liquid demand careful attention."

The mechanical condition of the soil is a matter of more importance than is commonly supposed. We say that a field has a cold soil. The soil of the field may have in its composition all the elements necessary to plant growth, and the crop yield may be poor except when the season is very favorable. Such soils are adhesive and take up and hold a large amount of water unless thoroughly underdrained. For the reason that if there is no way for the water to pass off except by very slow percolation through the under earth, then it must be removed by evaporation at the surface.

The removal of the water from the soil by evaporation requires heat to vaporize the water, so that the heat that would otherwise serve to warm the soil passes off into the atmosphere with the vapor of water.

The evaporation of the excess of water in the soil is a cooling process. We very properly call such soils "cold." We may not fully understand why it is, but we know the fact because we have had to do with such soils.

Underdrainage of the soil removes the excess of the water, leaving only the water of moisture or the water that covers the particles of the soil, leaving the spaces between the particles of soil, however small, filled with air. The water which adheres to the particles of soil is sufficient for the well being of our crops. The presence of the air and water in the soil effect important chem-

ical changes necessary in the preparation of food for the plant.

The moisture, before referred to, would be rapidly exhausted, but the capillary action of the soil brings up the water from beneath, like the oil flows up the lamp wick to supply the flame, so that the water covering the particles of sub-soil beneath add to the supply, and the roots of the growing crop descend to gather a supply of food and moisture.

Add to this the circulation of air through the soil, which carries with it more or less moisture. The air coming in contact with the cooler earth is also cooled and condensed, which lessens its capacity for holding moisture and gives its surplus of water off to the soil, the same as dew forms upon vegetation at night.

This supply of moisture is important, when drouths prevail. We have again and again observed during a drouth, that the vegetation along and near to a line of a tile drain was greener and less effected by the dry weather—so much so that the corn would not curl up during the heat of the day.

Further, we have observed that where the drouths were so long continued as to seriously damage the general crop, that along and near to the underdrains there would be a fair yield.

This favorable condition for the growth of our crops does not exist where the soils in the early portion of the season is wet and cold. The crops, if planted in such soils, are slow to germinate, and make a very slow growth, the feeding roots keeping near the surface to avoid the excess of water beneath, and to get the needed heat from the sun and the air so necessary to plant growth. The cold, wet soil, if stirred at all, becomes hard and cloddy. Later in the season if dry weather follows a wet season the crop is seriously damaged; the roots are

near the top of the ground; lacking depth of earth, and the soil has become so compacted as to give off what little moisture may be left, and the plants wither and dwarf.

Underdrains laid at the depth of three or more feet, fifty or sixty feet apart, would, in a short time, change the mechanical condition of the soil so that the necessary supply of moisture would be held in the soil, and the excess of water only would be passed away, and, in addition, the capillary action of the soil and the aeration or circulation of air through the soil would aid to keep up the supply.

If a heavy rainfall comes, the excess of water is passed down through the soil and away in twenty-four hours, or in less time, and the air follows it down, filling the spaces in the soil, and the upward flow of moisture is resumed, and the supply of food, air, moisture and warmth, necessary to the well being of our crops results from the favorable mechanical condition of the soil effected by underdrainage.

SOIL POROSITY INCREASED BY UNDERDRAINAGE.

No fact is better established than the increased porosity of close clay soils by underdraining them. Soils that are so compact as to allow a very slow percolation of water through them in their natural state, will, after being underdrained, admit the water freely. It is true, however, that some length of time is required to allow the various agencies to effect the porosity of the soil after being underdrained. The water at first finds its way slowly to the underdrain, the air following fills the spaces which exist between the soil particles. The air hastens the soil decomposition. Soil decomposition increases the porosity.

The roots of plants find their way

down through the minute openings, perform their office work and die—decay and thus add to the further soil porosity. Increased porosity implies an increased amount of air in the soil, which adds to the increased decomposition of the soil.

In this climate, an important agency in increasing the porosity of the soil is the frost. The freezing of the earth separates the particles of the soil. Deep freezing of the soil increases the porosity to a greater depth, which adds so much to the depth of the area through which the roots of the growing crop may descend for food and moisture.

Underdrained soils do not freeze so solidly as those not drained but they freeze much deeper. For the reason that in a drained soil only the water adhering to the particles of soil are congealed or frozen, the spaces in the soil being filled with air admits the escape of heat to the surface from a greater depth which increases the depth of the frost line. In this connection it is well to remark that drained soils thaw out much sooner, having a limited circulation of air, which carries with it any increase of temperature.

We are all familiar with the fact, that water will heat very slowly if the heat be applied at the top only, applying the same law the thawing of the soil must be slow where the soil spaces filled with water are solidly frozen.

It is a well known fact that drained porous soils are ready for the plow several days in advance of the compact soil.

The tillage of the soil ordinarily increases the porosity, except in the case of soil that is too light. There are soils so light and porous that they need to be compacted. But close, clay soils need to be tilled so as to make them more porous, the tillage increasing the porosity. This is true of any soil, except where a system of tillage is adopt-

ed intended to compact the soil. But the close clay soil that is not underdrained is compacted readily by a heavy rainfall and the work of tillage is made more difficult. The drained soil readily admits the passage of the water through to the drain, freeing the soil spaces of any excess of water, thus preserving the porosity of the soil which promotes the soil decomposition, which is so needful in supplying plant food for the growth of our crops.

With sufficient underdrainage both the surface soil and subsoil are made available for the growth of crops. Some of our good farmers who are belaboring close retentive clay soils on the surface, would be astonished at the result of their labor if their lands were well tile drained. A sight draft through underdrainage on the farms that lie underneath the farms that are at present being tilled would be honored so promptly that it would delight some who have hardly smiled for a decade of years.

WHAT TILE DRAINING HAS DONE.

The following is from an address by Mr. James K. Tucker, manager of Armant plantation, St. James, read before the Louisiana Sugar Planters' Association, Feb. 12, 1891. According to your invitation, I give my experience in the tile drainage business, which is quite short, and has been very pleasant. When we commenced putting in tiles on this place, a little over a year ago, I had but little confidence in it. I could not see how a four-inch pipe, at a distance of 90 to 100 feet could possibly take the place of a four-foot ditch; but I have been very agreeably disappointed. I will admit that the past season has been unusually dry, but, notwithstanding, we have had a good deal of rain. About the 18th or 20th of June we had one rain that was a tile drain tester.

This entire piece was a lake from the front to the back. Just as soon as the water began to fall in the outlet canals, the water disappeared on the tiled lands. That has invariably been the case after every rain we have had. It is very seldom that you will see water lying in the middle of the-row an hour after a hard rain, like you see on open ditched land.

We plowed several times after a rain, six hours sooner than we could on higher untiled land. We had 100 acres of plant cane on tiled land on this place last year, divided into four cuts. The tonnage on the different cuts were 32, 33 and 34 per acre. I do not give the tiles the entire credit of the heavy tonnage I think the land would have done nearly as well the past season without the tiles, but I do claim that we had rain enough to have entirely ruined the crop had the tiles failed to do their work.

There are a great many other advantages to be derived from tile drainage besides good drainage. The first very important item is, the land that is gained, which is from eight to ten per cent. It is a pleasure to plow a field of tiled land compared to one that is not tiled. A man that could keep from thinking of cuss words whilst watching a contrary negro and a pair of more contrary mules plow a ditch bank row would be a fit subject for a better country than this. There are no ditch banks to bother machines. There are no odd heap rows when hauling cane, and there is no more bother about that annoying and expensive quarter drain.

DRAINAGE AND TILLAGE.

The effect of draining in overcoming draught, by admitting atmospheric vapor, will, of course, be very much increased if the land be thoroughly loosened by cultivation, and, especially, if the surface be kept in a mellow and open condition.
—*Waring.*

Irrigation.

IRRIGATION IN CALIFORNIA

BY ALLEN FURNAS.

I will suppose that the ground is reasonably level, that is, free from elevations that the water cannot readily reach, or basins where it would accumulate in undue quantities, and yet, with sufficient fall to enable the water to slowly flow over the ground. Evenness of distribution is important. For instance, if there is double the amount of water on one place that there is in another, the ground will dry unevenly, and the dry patches will be too dry, before the wet spots are dry enough to plow, for in irrigating orchards, or any crop that requires cultivation, the plow or cultivator must follow as soon as the ground is in good working order. Ground with little fall is desirable, but suppose we have too much fall? Then we must run the water more or less at right angles with the direct course, in which it would naturally flow. This can be done by plowing a furrow or throwing up ridges so as to direct the water where desired. As it is best to run the water in the direction of the rows to be cultivated it is no uncommon thing to see corn and potato rows running angling across the field so the water can follow the furrow between the rows. If we are in the orchard we can choose our course among the trees. All small fruits should be so set as to take on water to the best advantage for distribution, no matter whether the rows run with the lines of the land, or the highway. The all important thing to accomplish is the even distribution of water. Some tact and judgement is necessary in this matter, in laying out the water runs, and to the inexperienced it is sometimes safest to

bring the "level" in requisition. This is the more necessary in consequence of the deceptive appearance of the lay of the land. It is an axiom here that water will run up hill to get to the ocean. Why this delusion occurs I do not know, but it is so not only with the "tender foot," but often with the old settlers also. All these things are to be taken in consideration in laying out the irrigating ditches in the field, and, of course, the main line conveying the water on the field must enter it at the highest point. Land that is to be put to alfalfa is neither furrowed or ridged but embankments are thrown around the lot to retain the water on it. Supposing the ground to be properly graded so as to receive water, the next consideration is now to prepare the furrows or ridges to convey it where desired. This may be done with a common turning plow, or single shovel plow. With ridges and furrows all in readiness we are prepared for water. With a "gate" of water, which means an opening five inches high and twenty inches long, with four inches head, two men will be necessary to direct and distribute the water and work the "tappoon." This is a half moon shaped piece of sheet iron with a wooden handle on the straight side, and is struck down across the stream of water, to stop it, or turn it, as desired. With a few "tappoons" and a long-handled shovel you are ready for business. Did I say ready? There is one other matter that the experienced operator will look to, that it is more, however, a matter of "taste," than anything else, it is your clothing. You may put on your store clothes, a "biled shirt," and black your boots, wear your plug hat, fine starched cuffs with moss agate sets, and perfume your handkerchief, but then you can make out with very common clothes, even old ones

except boots, which should be the best water-proof, at least I prefer good boots, but many of the young men go barefoot, with their pants rolled up to their knees and shirt rolled up to their elbow. Thus equipped he can wade, or, if necessary, thrust his arm in a gopher hole in stopping it up. By the way, these gophers cut considerable figure in irrigation. The water often finds its way into their holes and the contents of a run may pour in it for a long time, and then not fill it up. However, it generally does fill, sooner or latter, and if Mr. Gopher is at home he must vacate. When he comes out he is as "mad as a loon." If he is young, he will at once set to washing his face, much as a cat does when it is "licking up," but if an old specimen, then he will rear up "on the hind legs of his dignity," and fight it out on that line to the bitter end. Such a thing as "run" is not in the gopher make-up. In irrigation you must cut your coat according to cloth. Under the Santiago water system the water is free, and a pro rate of it is conveyed with each acre of ground by deed with the land, and by schedule of time you know when your run comes and are ready for it. Our run comes every twelve days and a half and you can use the water whenever you wish—this time on the orchard, next time on the alfalfa, and next on corn and potatoes; or divide your run among your crops as you prefer. But you must use your run, for when your time is out your neighbor comes in, and is quite as likely to want all his time as you are yours. Just across the creek they are under the Santa Anna system, which is altogether different. There they can have water nearly at any time they wish, but they must pay twenty cents an hour for a day run, and ten cents an hour for a night run. Thus I have only given you

an inkling of irrigation, I think perhaps sufficient, for I suppose you only wanted a general idea of the work as a matter of curiosity to compare with Colorado's system—*Farm Journal*.

Agricultural.

SUCCESS.

Every man has his ideal of success. It is a little peculiar and a matter of entertaining study to know the different fancies and standards in the minds of men that make the end aimed at the most desirable to be attained.

One man devotes himself to brain power, and feels that he has made the highest success when he shall have commanded the admiration of his fellows because of his splendid mental attainments. Another makes wealth the end of all his ambition; another worldly honors; and, still another is satisfied with the tinsel show of dress, and feels that life brings its best purposes in the glitter of attractive display.

"The ends to be aimed at" are almost as varied as the minds that pursue them. Not only do we find these differences among men, but we find still further diversity of ideas even in the same business or profession.

It is more particularly my purpose to speak of the different standards of success as we find them in farming.

I have in my mind, just now, a farmer who is said to be a success. His teams are always poor, and therefore easily overburdened.

The tenant houses on his farm are dilapidated and in a state of decay; his fences are in bad shape and there is all about his place an appearance of thriftlessness. This man is called a successful farmer, because he has money to lend, all made on his farm. He has made

money by stinting niggardliness. This is not success.

I have another farmer in mind, who has good stock. His place is neatly kept, his fences in good order, and there is an appearance of thrift all about his premises; and he has more money at the end of the year than is required to meet the expenses he incurs, yet he has not a child that can read a line or write his name. This farmer makes his money by making slaves of his children. What is such success worth? No entertainment and no pleasure above that of brutes. No man makes a success of his business, whatever that may be, who does not provide for the mental and spiritual interests of his family.

I know still another farmer whose family is highly cultivated. He has quite a neat and comfortable home. He is about able to pay his expenses. His crops all look well and it is a pleasure to visit his fields, but he told me some time ago that life was a failure with him, because he never could have any more money than was actually necessary to run him.

All these men have determined in their minds that money makes success. Indeed, that is the generally received opinion of most men that money makes success. In the opinion of most men, whatever may be the attainments of a man, if he has no money his life is to a great extent a failure; on the other hand, the man who has money, regardless of other circumstances, is a success.

I do not believe this to be the true theory. Money does not always make men—that is, the simple possession of it. The best success is not in the bare accumulation of money, but in its intelligent and advantageous use.

It is highly important in planning for success to plan to make money in the most profitable way. When I say the

most profitable way I do not mean the way that will bring in the largest amount under permanent methods.

The best success is such as keeps the home and the farm in good shape; the stock in thrifty, healthy condition, and furnishes the children the best advantages for school training and for society.

The world is too much given to money as the ultimatum of success. Farmers do not need to work solely for money. A bright-faced child with a cultured mind is far more attractive than a good large bank account made by a farmer whose children sit around him as stupid as dolts. Work for the highest and best success, make money for its best uses and not for its miserly accumulation.—*W. J. Northern in Southern Cultivator.*

SELL A PART OF THE FARM.

Where farmers are burdened with debt there should be no hesitancy to sell a part of the farm and thus get rid of the worry, that not unfrequently brings men to premature graves.

Two neighbors in this State (Indiana) furnish striking examples of the wisdom of such a course. Mr. Brown had rented land for a number of years, in which time he had accumulated property to the value of four thousand dollar. He had four sons, large enough to help him. Very naturally he felt that he ought to purchase a home for his family. He bought a farm of 160 acres (not very well improved) for which he agreed to pay \$7,000, paying \$2,000 down and the remainder in deferred payments with six per cent. interest. There were necessary improvements to be made so as to make his family comfortable, which absorbed several hundred dollars of his capital. At the end of the first year he found himself barely able to pay the interest. The unpaid note after maturity drew eight per cent. A bad crop season or

two and the debt had increased. Then his older sons were coming to manhood and required some advantages common to other young men of the neighborhood.

Mr. Brown struggled on for fifteen long years, his sons marrying during the time, were helped to start, so that at the end of the time named he and his wife were broken down in health, and the weight of debt heavier than when the farm was purchased. Both of them had worked and worried over the burden of debt. They had denied themselves every luxury and many of the necessities of life. The price of land had declined and creditors must have their money. The farm was sold at a sacrifice and he and his wife were left empty handed at a time of life when they most needed a home.

If they had bought eighty acres and paid for it, and put the same labor and employed the same capital, they might have added to their store until they might have purchased eighty acres more and had no worry over indebtedness.

Robert Russell, an adjoining neighbor, came into possession of a 160 acre farm by inheritance, when he was 35 years of age. The farm was mortgaged for \$4,000, bearing seven per cent. interest. He had, also, a family of five children, the three oldest being boys.

Mr. Russell, however, estimated the interest, taxes, necessary improvement, and the cost of living, then submitted the matter to his wife—to attempt to carry the debt and pay out meant a life struggle. The least misfortune would likely turn the scales against them. They wisely determined to sell half of the farm, and expend their time and energies upon the remaining half. It was done, the indebtedness paid. They were industrious, frugal people, lived well but economically. In two or three

years they had a little money laid up, which they loaned at interest.

They thoroughly underdrained their land, saved their manures, cared for the little things, raising crops of enormous yield. Being out of debt they had the advantage of the best market. They had some time for rest and recreation, educated their family, and, as they married and settled, Mr. Russell was able to help them to start in life.

He purchased 20 acres adjoining, making a farm of 100 acres.

They are now over fifty years of age, enjoying excellent health, and well-to-do. He has repeatedly remarked, that the best thing he ever did was to sell half and get out of debt. The next best thing was putting his land into condition to grow remunerative crops, which made a certainty of his business.

There are hundreds of farmers who are large landholders, but deeply in debt, using all the profits of their business to pay the interest on borrowed money. They drive their business, try to compass more territory, extend their business with the hope that luck or some good fortune will carry them through. How much better it would be for them to sell their land, pay their indebtedness, if they have only 40 acres left free from incumbrance. They would be happy compared with the care and anxiety that weighs heavily upon them as it is.

It is far wiser to sell land and get out of debt than to increase the indebtedness by buying more land. Sell and get out of debt, and then put your hands and brain to work to make the most of what you have as your own, free and uncumbered.

Cincinnatus, who is said to have been called from the plow to the throne, is said to have owned only seven acres of land, the management of which gave

him the reputation of being the most successful farmer in the kingdom.

Dividing up the farms increases the population and compels better farming, increases the value of the land and brings a better prosperity.

It is a great folly for aged men to hold large landed estates when they might be divided and furnish homes for active, industrious young people, and the owners would be relieved from the daily anxiety of business. But it is still a greater folly to hold large landed estates burdened with indebtedness.

Don't think it a little thing to begin on a few acres of land to make a living. Underdrain it, manure it, till it. Raise the best crops, save your earnings, and, our word for it, you will succeed, if you have the muscle and brain.

THE DISPOSAL OF COUNTRY SEWAGE.

In a circular sent out by the state health board of New Jersey, suggestions are made for the disposal of refuse in places without sewerage. They are intended in particular for the consideration of dwellers in 'scattered village houses where neither your own nor your neighbor's well is near, and where the population is not large.' Ashes or what remains from the fires are the first waste to be disposed of; dust sweepings and similar refuse the second; wash water from kitchen and laundry the third; forth, bath-tub, and usual wash-tub water, and fifth, secretions or excretions voided from the human intestinal or urinal tract.

The first caution given is to never mingle any of these products when it is possible to avoid doing so. 'The ash heap,' says the circular, 'is misused if it becomes a place of deposit or burial of any of the other materials.' While sifted ashes have an absorbent, and

some corrective power, if used in heaps, in this way they become damp and degenerate into filth heaps. Wet ashes cause dampness and mouldiness. Hence they are to be kept separate and dry and cleaned away occasionally as convenience and health indicate. At the spring and fall house-cleaning at least, they should be fully removed.

It is a rule as to all dirt, sweepings, etc., that they should be disposed of in the kitchen range or fire. We know of many who carry the use of fire for the disposal of refuse much further. There is now furnished a close pan or heater in which peelings of fruit and vegetables, and bits from all culinary operations are so dried as to be cast into the fire and add to the heat. Thus all evil effects from them are avoided.

The wash water from the kitchen and laundry are always to be looked upon as fouled waters. The soap tends to separate into its original fats, and the greases are especially prone to nauseous decompositions.

The kitchen liquids contain much animal matter in the form of shreds of meat or viscera. Many claim that the decomposition from these sources may become as disease-breeding as our ordinary secretions.

Bath-tub and wash-bowl water, while not so impure as some other liquids as representing soap and secretions from the skin, are also to be gotten rid of.

It is, as a rule, a wrong course to combine these various kinds of refuse, and still worse to convey them to the outside privy vault as a general receptacle. By a little prudence in use and a little industry they are easily disposed of. As a rule the liquid products from an ordinary family are not enough to do any harm if disposed of on the surface of well drained ground. Besides the use of them about bushes, grape

vines, or trees, according to their needs, there may be near the foot of the house lot a series of furrows or deep trenches made with the spade or hoe into which these can be thrown alternately.

If the ground is clayey, it should have been underdrained.

Oats or corn sown in rows between the trenches will aid much in taking up the summer excess and in protecting from the sun. We have never known a family embarrassed in the disposal of these liquids if only some such separating and absorbing system was carried out.

Different parts of the plot or trenches should be used different days.

We know of no record or case where a well over twenty feet deep and fifty feet distant from a plot or trenches thus used for these fresh liquids has ever fallen under suspicion of being effected. This is quite different from pounding in cesspools.

If undrained soils become too wet, there is remedy in the use of agricultural tile or in frequently changing the terminal end of the pipe. A few feet of lead pipe at the terminus easily admits of this change. As a rule the dry and the dry kept out-house is the best place for voiding intestinal excretions. It should never be the place for emptying any indoor vessels. The deep and hidden cesspool system should be abandoned as far as possible. Where cesspools must be used, it is far better and less expensive to have two or three disconnected ones, not deep, easily cleaned, and built as we have indicated for each variety of slop, rather than have one great storehouse for a pond of foul liquid.

Too much attention cannot be given to the sanitary provisions necessary to the health of the home.

SHALLOW CULTIVATION.

As the seasons come and go the converts to and friends of surface cultivation become more numerous. Several years' very careful observation has thoroughly satisfied us that the production of millions of bushels of corn have been prevented by deep cultivation. In writing upon this subject, Hon. W. D. Hoard, late governor of Wisconsin, and editor of *Hoard's Dairyman*, says that the frequent stirring of the soil is greatly increased in a season of drought. The reason is that the top of the soil by frequent stirring is made to act the part of a sponge, and arrests the moisture that is being constantly poured into the air above.

We once made the following experiment to obtain an approximate idea of the amount of moisture thus drawn off, and the hindering effect on evaporation through constant stirring of the surface soil.

During a prolonged drouth a place in a well travelled highway was selected, where the fine dust was several inches deep. A large bell glass (a two-quart Mason fruit jar will answer the same purpose) was well chilled by contact with ice, wiped perfectly dry and placed mouth down on the dust and covered with several thicknesses of white cotton cloth. After a period of five minutes the cloth was removed and it was found that sufficient moisture had arisen from the dust, and condensed on the cold glass to run down its sides and form a wet ring in the dust, quite plainly discernible.

On the side of the road was a field of corn which the owner had not cultivated for more than a week. The dry weather had formed a multitude of fine cracks in the soil, out of which moisture was passing at rapid rate. To determine

the difference in the evaporation of the unstirred dust in the road was a fact that would be valuable to know. Accordingly, we again chilled the glass and placed it in the corn field in the same manner and for a like period of time as in the road dust. The result showed to our satisfaction that the moisture was pouring out of the corn field at least three times faster than in the road.

Had the owner of the corn field kept the ground stirred lightly on top every two or three days he would have arrested this wasted moisture and thereby watered his corn very effectively, besides destroying the noxious weeds. It was worth to us all the time and trouble taken in the experiment to know this principle and learn how thereafter to turn it to valuable account in the cultivation of corn and other crops.

A farmer in giving his experience to the *American Agriculturist*, says: "It has been my practice for many years to work the corn once a week, beginning on Monday, when the weather was suitable, and continue the working as long as the horses can get through the rows without breaking the stalks—and this is usually until the ears begin to hang out in the rows—and the cultivation has always been on the surface. Some years ago a heavy rain washed a slope on one of my fields very badly, and exposed a fine network of roots for several square rods, which completely filled the soil. Several of the plants were washed loose, and could be taken up by the roots. The roots of many were eight feet long, spreading over nearly three rows each way, and they lay very near the surface. In places roots were abundant at a depth of two inches and very few were as deep down as the land had been ploughed. More recent examinations, made purposely, have convinced

me that this is the habit of the corn plant to send out its roots near the surface. It may be that the surface manuring with fertilizers tends to such a habit of root growth, but soluble fertilizers quickly diffuse themselves through the soil, and it may be that the desire for the sun's heat, which corn so much needs, brings these roots to the surface.

"It is clear that a plant having such a superficial root growth should not be ploughed, but requires only surface cultivations, for the breaking of roots must necessarily check the growth of the plants. I had once a plain demonstration of this fact. A field of evergreen sweet corn was partly ploughed, contrary to my instructions, by a wilful hired man, who laughed at my shallow cultivation on the rest of the land. He ploughed it deeply and ridged up the rows until I discovered and stopped him. The weather was hot. The corn wilted at once and never grew afterward. Not one ear was gathered from the ploughed rows, while the rest of the field averaged over 11,000 ears per acre, counted for the market. To break the feeding roots of a plant is clearly to stop its feeding, and to turn all the power of the growth to repair the damage and make new roots, at a time, too, when all the strength of the plants is required to form the blossom and the grain. Something has been said of the usefulness of root-pruning corn. It is equivalent to drawing cow's teeth when she is busy turning good grass into milk and butter, and equally prevents the gathering of nutriment. It is practised for this special purpose in fruit culture, for checking the growth of trees to reduce the amount of new wood, and it has the same effect upon the corn which we want to hasten to maturity as soon as possible, and to aid every way in en-

abling it to gather food and increase its product.—*Kansas Farmer.*

IGNORANCE IN THE BUTTER.

Not exactly in the butter, but ignorance in butter making is touched up as follows in *Hoard's Dairyman*:

"Ten cent butter, as a rule, is loaded down with ignorance. Ignorance presides at every step in its history—ignorance of what the maker should have known to have made it worth as much as the best.

"The original butter fat as it came from the cow is all right; but ignorance took it in hand and its course was downward from that time on. The people who make cheap store butter are just the ones who despise knowledge, and are always talking against reading and knowing more. Their butter shows it. That is the way Heaven takes to punish them for their contempt of knowledge. What an amount of punishment they can endure! These people stand on their own necks, and by making poor butter surrender their own field to hog and bull butter, cotton seed oil and fraud."

Well, well; we think if some of the good women who sell their butter to hucksters at 10 and 12 cents per pound were to read the above extract, and had the opportunity, they would ring the large nose of ex-Gov. Hoard, who is proprietor of the *Dairyman*.

Ignorance, indeed! Have they not had the experience of many years and know as well how to make butter as Gov. Hoard? Indeed, more, Their butter may be a little off in color but they do not use butter color. The butter may be a little thin and disposed to run but the warm weather does that. It may be a little rancid occasionally but they have no cool place to keep it. It may come to market done up in rags

taken from the tail of the nether garments, but what of it? It is butter all the same.

The ex-Governor is a little over-nice if he does not like such butter. There are a few such squeamish people who boast of paying 30 and 40 cents a pound for butter, believing that they get a superior article. But there are such people always to be found, in the past, present, and probably the number will be increased in the future, so let the number be increased—it may help to increase the price of butter made by the ignorant. Who can tell?

Bro. Hoard, we advise you not to wander around loose in some sections that we know and give expression to such utterances, lest your course might be downward.

HOW ONE FARMER MAKES MONEY.

Do you belong to that class who had as soon sell a man a poor cow for a good one, or a rogue for an orderly one, as not? Bah! You ought to outgrow this. Could not you respect yourself more and would you not be better respected by your neighbors if you were never guilty of such an irregularity? A friend of mine invariably sells an animal on its merits when he sells (everything else, in fact, also). He will not even wait to be asked, Is this cow breachy? or, Can you warrant the horse sound? He will say, My price is so much. I put it at this low figure because the cow will take down fences. If you want the horse at such a price take him along. You will find he has the heavens. Of course you don't expect to buy a sound horse as fine as this one for any such money. And he never has difficulty in disposing of anything. People know him as an upright man and always find things as he represents them. He says, "I made up my mind as a young man that I

could not afford to equivocate, and this even when I left out the question of morals. Jockeying is not my business. I make my money by farming." Would there were more like him.—*Farm and Home*.

BEARING ON CHECK REINS.

The Queen of England has directed the Duke of Portland, Master of the Horse, to order the removal of all bearing reins from the harness of her carriage horses. This will have a great influence with the owners of other carriage horses throughout the Kingdom, as they look up to her for the fashion of their livery, for as the Queen does in most all things they faithfully follow. The bearing rein is very painful to the horse, especially when he is hitched to a post or standing waiting to be driven off, unless it is left so loose that he can move his head up and down at full length as he may desire. Coachmen check their horses up so unmercifully high as to keep them in great pain, as may be observed by throwing their head and neck first to one side and then to another and tossing them up and down. They think this makes them show very fine, but the position is not so taking as to allow the horse to retain his easy, natural standing. He may be checked up loosely without pain to keep from gnawing at a tree, or grass, or anything hurtful near by.—*Horse Gazette*.

HORSE SENSE.

It is a pity some men could not be made to endure some of the cruelties they practice on their horses. If such a brute could be hitched to a wagon, with his eyes blinded, a harsh bit in his mouth, and another man behind him with a raw-hide whip, who, when he wished him to start, gives him a cut,

and if he does not increase his speed to suit, gives him several cuts, or yanks his jaws with the reins with a force sufficient nearly to break them. Such a dose of his own kind of treatment would undoubtedly teach him such a lesson as he would remember.

Saddle riding is growing in favor and if there was more of it, there would be less consumption, apoplexy, and paralysis.—*Horse Breeder*.

COMMON COW SENSE.

Every farmer should raise upon his farm all that he can for his stock then, if he hasn't all the necessary foods, he should buy them. Every dairyman needs a silo. He can produce food by this means of a better form and by a cheaper method than in any other way. He also wants clover and clover made up in every imaginable way. Besides being rich food for the cows there is no better factor in tillage. It is as good as a partner. Also put in a field of oats and peas. This is a perfect food for the dairy. Buckwheat is another good thing to feed the cows. This combined with corn, clover, oats and peas makes an admirable ration, for buckwheat grain is one of the best and cheapest foods for animal growth. Again, keep your cows in warm, light dry stables, for if kept otherwise they are kept at a loss. Don't try to raise cream on sour milk and then don't try to keep it too long after it is raised. Much poor butter is made in the cream jar. The bitter taste in butter is but a peculiar putrefaction which is made when cream or butter is kept in a cool temperature. Thirty-six hours is as long as cream should ever be held before churning, 24 being long enough in summer. Again, stop the churns when the butter comes.—*John Gould, Portage County, O.*

Road Drainage.



ROADMAKING.

The present system of roadmaking, as practiced in this State, should be abolished. In its stead enact a law that will provide for men to work on roads that know how and are willing to work, and pay them good wages. Provide the necessary machinery to do the work well at the least possible cost. Place at the head a township road overseer or commissioner, competent to superintend the work and hold him responsible for the work.

Then, let everybody pay a road tax—not in work but in money.

We should not be content with doing any but the best work, economically done.

We must have better roads—harder, smoother, better drained, free from mud, and the less mud the better. Roadways in wet soils should be tile drained. It is the least expensive method to permanently secure a roadbed. Underdrain, grade smoothly, make the travel way smooth and narrow, and gravel where gravel can be had, which, together with substantial bridges and culverts, will

make a good travel way. Then keep the travel way smooth by frequent scraping.

RATHER EXPENSIVE ROADMAKING.

We clip from the *National Live Stock Journal* the following item on roadmaking:

"In swampy countries good roads have been made cheaply by felling and burning timber, and using the charcoal. The timber is cut and piled up lengthwise in the centre of the road, and then covered with straw and earth in the manner of coal-kilns. The earth required to cover the piles, taken from each side, leaves two good-sized ditches. When the timber is charred the earth is removed to the sides of the ditches and the coal is raked down to the width of fifteen feet, leaving it two feet thick at the centre and one at the side."

We conclude that it would be rather an expensive method. A line or two of tile would be better at one tenth of the expense.

THE last thing I wish to call attention to is the pressing importance of permanent road improvements. It has been discussed until the subject is somewhat threadbare, but nothing will come of it unless those who do the work take hold with an honorable intention of making their work count in the direction of permanence. If a hill is lowered, a hollow filled, a culvert foundation built for all time, or a swamp crossing thoroughly drained, to that extent the work is for years and not for a summer, and will bear fruit in a lessening of those taxes which every passer over a bad road pays in wear and tear of vehicle, team and temper.—*Ex.*

Few people have taken the pains to the actual cost of bad roads, in the wear and tear of team and vehicles, the loss of time and less loads that are drawn—a very expensive tax.

Tilemaking.



SITTING ON A TILE.

When the boom struck the tile business, most any kind of a tile would sell, rough or smooth, hard or soft burned. Then tile sold easily. Now he that buyeth is particular. He looketh at them, turneth them over, striketh them together. If they ringeth not right, he condemneth them.

He looketh through them to see if they are smooth and round inside, so the water will have unobstructed flow as it runneth.

The ends of the tile needeth to be square and without flaws or cracks, if not he buyeth not.

And he buyeth not without asking how much off for cash, and, then, if ten per cent. off for ready money is offered, he sayeth that thirty days is the same as cash. If he buyeth at thirty days, it is three times thirty before he payeth. If the discount is refused, then he goeth and buyeth of neighbor Smith.

Verily, verily, rather than have him get his tile of Smith he can have them for 20 per cent. off.

Every business hath its ups and

downs and the tile business is not an exception.

But while he sitteth upon the tile he resolveth to give more attention to the business.

To see that the clay is better mixed before it goeth into the mill to be pressed into tile.

To see that the mill is kept full of clay, that the tile may be more perfect in form, for verily tile are not made of wind.

To see that the tile are smoothly cut, and carefully handled, so as to preserve the perfect form, and dried without cracking.

To see that the burner burneth them well, that they may have the right ring when he that striketh them together doeth so to determine their hardness.

To see that the tile are piled upon the yard in good order, so that when the owner walketh forth he shall have no need to apologize for the unseemly appearance of things.

When all this is done the owner will look upon the well ricked tile, with anticipatory joy, thinking how he will handle the shekels when he selleth them.

Then he will talk of the benefits of underdrainage, and how blessed is the man that knoweth of the benefits, and talketh about them, for the more talk the more sales of tile—the more sales of tile the more corn or wheat or vegetables, and the more increase of productions the greater prosperity of the country, and the greater the prosperity of the country the better the administration in power. So writeth IDDO THE SEER.

"Mornin' paper, sir—only two cents," sang out the Boston newsboy. Here's five cents, sonny," replied the facetious customer, keep the three cents, buy a cake of soap, and give your face a wash—

ing." The newsboy handed back the change with much dignity, and said: "Keep the change yourself, sir, and buy a book on decorum."

WOOD AND COAL COMPARED.

In answer to some inquiries as to the comparative value of wood and coal for burning clay wares, we re-publish the following communication from W.A.Eudaly, the same having appeared in the JOURNAL five years ago. It will be read with interest again by those who read it when first published. Mr. Eudaly says:

"In order to answer a great many questions, and at the same time broach a subject that may lead others to give your readers some very valuable information, I have undertaken to make a partial comparison of the value of wood and coal as fuels.

"It must be remembered that there are a great many kinds of both coal and wood. But we must have a starting point some where. So I have taken bituminous coal. This being the kind used by most of the clay burners in the country, I have made an average of the various kinds of bituminous coal and taking that average as a standard with which to compare some of the different kinds of wood.

"In order to take up but little space in your columns, and at the same time put the comparison in as comprehensive a form as possible, I have formulated the following table: (See next column.)

"The comparison is made with wood cut green at the proper season of the year and well seasoned.

"Every one knows that the time which wood is cut has a great deal to do with its value, also, that well seasoned wood is much superior to green or water soaked wood. Especially is this the case in burning tile or brick, for the

reason that the water in the wood after being converted into steam has to pass through the kiln in order to escape, besides it takes a large proportion of the heat generated by the burning of the wood to convert this water into steam. Another fact must be taken into account, that is, the same kind of timber grown in different soils, produce different qualities of wood.

TABLE—Showing a comparison of several kinds of good well seasoned wood with good bituminous coal of 2000 pounds per ton or 80 lbs. per bushel.

KINDS OF WOOD.	Pounds per cord of well seasoned wood.	Pounds of coal equal to one cord.	Bushels of coal equal to one cord, 80 pounds to the bushel.	Cords of wood equal to one ton of good coal.	Per cent. value of wood per cord compared with good coal.
	Lbs.	Lbs.	Bu.	Cords	Pr. ct.
Shell-bark Hickory	4469	1787	22 $\frac{3}{4}$	1 $\frac{1}{8}$	89
White Oak	3821	1528	19 $\frac{1}{8}$	1 $\frac{1}{8}$	76 $\frac{1}{2}$
Southern Pine	3375	1354	16 $\frac{5}{8}$	1 $\frac{1}{8}$	68
Red Oak	3254	1301	16 $\frac{1}{4}$	1 $\frac{1}{8}$	65
Hard Maple	2778	1151	14 $\frac{1}{4}$	1 $\frac{1}{8}$	57 $\frac{1}{2}$
Beech	2875	1150	14 $\frac{1}{4}$	1 $\frac{1}{8}$	57 $\frac{1}{2}$
Hazel	2870	1148	14 $\frac{1}{4}$	1 $\frac{1}{8}$	57
Virginia Pine	2689	1075	13 $\frac{1}{2}$	1 $\frac{1}{8}$	54
N. J. Pine	2187	854	10 $\frac{3}{4}$	2 $\frac{1}{8}$	44
Cedar	1910	764	9 $\frac{1}{2}$	2 $\frac{1}{8}$	38
Yellow Pine	1904	761	9 $\frac{1}{2}$	2 $\frac{1}{8}$	38
White Pine	1863	747	9 $\frac{1}{2}$	2 $\frac{1}{8}$	37
Spruce	1685	674	8 $\frac{1}{2}$	3	34
Hemlock	1240	496	6 $\frac{1}{4}$	4	25

"Timber that is grown on clay or upland soils, ordinarily will produce a great deal more heat than the same kind of timber from low wet lands.

"Again, wood cut from thin timber lands is usually stronger than that cut from the denser forests.

"We think these are sufficient reasons to show the impossibility of fixing any definite ratio of comparison between wood and coal as fuels.

"One thing is well settled, however, and that is, that one pound of any kind of timber, when well seasoned, will produce about the same amount of heat, the difference being in the number of pounds per cord. To illustrate, one

cord of white oak weighs about twice as much as a cord of white pine. Therefore, one cord of white oak is equal to two cords of white pine, both being *well seasoned and dry.*"

DAY-DAWN IN THE COUNTRY.

I do not think that it is ever real morning except in the country, writes Dr. Talmage in the September *Ladies' Home Journal*. In the city, in the early part of the day, there is a mixed color that climbs down over the roofs opposite, and through the smoke of the chimney, that makes people think it is time to get up and comb their hair. But we have real morning in the country. Morning! "descending from God out of Heaven like a bride adorned for her husband." A few moments ago I looked out, and the army of night-shadows were striking their tents. A red light on the horizon that does not make me think, as it did Alexander Smith, of "the barren beach of hell," but more like unto the fire kindled on the shore by him whom the Disciples saw at day-break stirring the blaze on the beach of Genesareth. Just now the dew woke up in the hammock of the tree branches, and the light kissed it. Yonuer, leaning against the sky, two great uprights of flame, crossed by many rundles of fire! Some Jacob must have been dreaming. Through those burnished gates a flaming chariot rolls. Some Elijah must be ascending. Morning! I wish I had a rousing bell to wake the whole world up to see it. Every leaf a psalm. Every flower a censer. Every bird a chorister. Every sight, beauty. Every sound, music. Trees transfigured. The skies in conflagration. The air as if sweeping down from hanging gardens of Heaven. The foam of celestial seas plashed on the white tops of the spiræa. The honey-suckle on one side of the porch chal-

lenges the sweetbrier on the other. The odors of heliotrope overflow the urns and flood the garden. Syringas, with bridal blossoms in their hair, and roses bleeding with a very carnage of color. Oh, the glories of day-dawn in the country! My pen trembles, and my eyes moisten. Unlike the flaming sword that drove out the first pair from Eden, these fiery splendors seem like swords unsheathed by angel hands to drive us in.

LOVE AMONG THE SIOUX.

To me, one of the customs of courting is very strangely in keeping with the wild, yet romantic, life of the Sioux, writes Warren K. Moorehead, in the September *Ladies' Home Journal*. A young man desiring to make love to the lady of his choice, works patiently for several days and constructs a reed flute. There are five or six holes in the instrument, and eight or ten notes can be produced upon it. The sound is wierd and plaintive. Some beautiful moonlight night, about eight o'clock, the young man leaves his home, and stationing himself about one hundred yards from the home of his intended, plays for one or two hours a series of strange melodies, all of them in the minor key. The sound floats out on the summer's air, and, perhaps, a prairie dog on the plain near by, disturbed by the music may raise his small voice in protesting barks; or, a great white owl, in a scrub oak, may hoot and whoo in derision. The sound is as sweet to the maiden's ears as the voice of the lover himself. She listens attentively, and when she concludes that he has played sufficiently long to assure her of his serious intentions, she timidly walks forth from her home. Throwing the now useless reed upon the ground, the young man rushes forth. Then ensues a scene such as only those who have been lovers can appreciate.

The Drainage Journal.

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The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile.

It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers.

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DRAINING IN QUICKSAND.

How can I tile where there is quicksand and not have the tiles fill up with sand? is the question asked, and generally answered by saying: "Use pipe tile and insert the two joining ends into a collar," etc.

The advice given is well meant, and, according to some books, but practice has demonstrated a much better means of preventing the entrance of quicksand into the pipes, which is to cover the joints of the tile with clay which is better, much better, than collars, and usually at hand.

Of the two thousand tile factories manufacturing tile in the United States

we venture the prediction that not one out of fifty make collars for tile and keep them in supply. The use of clay to cover the joints of the tile has proved such an effectual means of keeping out quicksand that the use of collars has been abandoned.

If the underdrain is being laid in sandy soil where clay cannot be had conveniently, then use a strip of tar paper three or four inches wide and wrap it around where the tile join together, which will be easier done and more effective when done, than collared joints.

It is very difficult to get a collar that will fit the joints so as to keep out running quicksand. First, use clay. If clay cannot be had, use tar paper; the paper will last for years, when, if it gives out, the sands and soil about the joints will be so compact as to give no trouble in the future. The clay will be on duty generations to come.

THOSE WHO OPPOSE EXPERIMENT STATIONS.

Occasionally we find, in running through our exchanges, a paragraph intended to convey the idea that the money expended in conducting Experiment Stations is a waste; that the men who have them in charge are young dudes, or, mere professionals, that every product grown costs three or four times more than on the farm.

In this connection, we have observed another fact, which is, that those writing such paraphrased, or articles, are newly fledged agricultural paper adventurers, who have taken advantage of the boom to organize farmers societies, to start new papers, and squeeze advertisers.

Invariably they are men without character as editors or farmers. In their zeal they undertake to out-do all

that have gone before, in abusing those who are likely to contribute to the general intelligence of the Agricultural World, and the practical facts belonging to the business of farming.

They realize that in proportion as the farmers rise in the scale of intelligence as a mass, their own calling will slip away from them. Leading intelligent farmers take no stock in the vituperations and misrepresentations which appear from week to week in such publications.

It is their business to "make believe," that farmers as a class are being ground to powder between the upper and nether millstones of oppression,—that they (these adventurers) are the Moses', that are to lead the farmers out into the "promised land."

Experiment Stations are generally conducted by intelligent, practical men, through whom the government is making an effort to advance the agricultural interests of the country. It is all a mistake to think that these Stations are conducted by kid glove gentlemen, as these "make believes" would have farmers think.

What farmers need to do is to co-operate with the experiment stations. They will gladly give any information at their command, of value to farmers, and will be pleased to profit by any practical suggestions that farmers may make as to conducting the experiments.

The Station Bulletins are sent to any farmer requesting them, and sent, too, without costing those that receive them, one cent.

We have visited several Stations in person, alone and in company with leading intelligent farmers, and we have found little if any thing that needed special criticism and we have seen much to commend; neither have we heard those with us, indulge in any criticisms.

We have found those having the management of the Stations in charge, with their coats off, and soiled garments, working like any of the rest of us do on the farm, only this difference, they make a note of every thing done, systematize the business, testing the different kinds of products on different soils with different tillage, manures, etc., and report the results, so that every farmer who will, may avail himself of the information gained.

The Superintendents of these Stations must be practical in what they undertake to do; if not, they make themselves the laughing stocks of intelligent farmers. There are thousands of farmers who are practical, who do know how to do, and why they do; who do read, and observe closely, at home or wherever they are. But these are not the men who make fun of experimental Stations. Those who do, have been misinformed, or have been misled, by unprincipled men who have appealed to their ignorance, to boost up their own business. Assuming to know much, when, indeed, they know nothing of practical value; and, are, in fact, mere leaches, fastened upon the hulk of ignorance, to suck out a living by publishing a so-called farmers paper.

WE HAVE WORRIED ABOUT IT.

For several years in our trade with Germany, pork has been interdicted and "we have worried about it." Again and again the matter has been pressed upon the German government to remove the restriction, but without success until a short time since. The agreement not only provides for the sale of pork to Germany, but also allows to the United States the same schedule of farm products that it does to Russia.

Secretary Rusk is confident that we will soon be able to extend our corn

trade by introducing it in Germany as an article of food in the place of rye, which is a very short crop in Germany this year.

SURPLUS PRODUCTS WANTED.

It is estimated that the countries of Europe this year will need 384,000,000 bushels of wheat. And it is also estimated from agricultural statistics that the United States, Canada, Russia, Turkey, Hungary, Australia, India, South America, Persia and Egypt have a surplus of about the same amount. There will be a demand for the entire surplus and those having wheat to sell ought to get a price equal to its actual value, and, they will, if the law of supply and demand is allowed to control the price, but who can tell what the Boards of Trade may do. Gambling in the futures of products ought to be wiped out the same as the lottery business.

THE INDIANA TILE CONVENTION.

The annual meeting of the Indiana Tile, Brick and Drainage Association will be held in Indianapolis, December the 7th and 8th. The programme will be published in the November number of the JOURNAL.

This far in advance we wish to request those interested in the manufacture and use of tile to arrange their business so as to be present at this annual meeting. Let us anticipate now, and see, then, one of the old time gatherings when the halls were not large enough to hold the members. Good crops and a common prosperity will add much to the trade, so that no one can well plead poverty as an excuse for not attending.

We need some of the years gone by enthusiasm. Come and fill up—with—*enthusiasm* and learn many good things from your brothers in the business.

EXHIBIT AT THE INDIANA STATE FAIR.

E. M. Freese & Co., late of Plymouth, Ohio, now of Galion, Ohio, removing to the latter place the 1st of the month, where they have built large and commodious buildings, so much needed in accommodating their trade. The exhibit of the Company at the late State Fair, in this city, was conducted by Mr. B. C. LaDow, their general agent, and was a success in every particular. Those interested in clayworking machinery, visiting the exhibit, spoke in high terms of it.

C. W. Raymond & Co., of Dayton, O., also exhibited his Repress machinery, winning the good opinion of all, as they generally do.

Miscellaneous.

"TEAMSTER JIM."

It ain't jest the story, parson, to tell in a crowd like this,
Weth the virtuous matron a-frownin' an' chidin' the leggin' miss,
An' the good old de con a-noddin' in time weth his patient snores,
An' the shocked aleet of the capita! stalkin' away through the doors.

But then, it's a story that happened, an' every word of it's true,
An' sometimes we can't help talkin' of the things that we sometimes do,
An' though good society coldly shets its doors onto "Teamster Jim,"
I'm thinkin' there's lots worse people thet's better known than him.

I mind the day he was married, and I danced at the weddin' too,
An' I kissed the bride, sweet Maggie, daughter of Ben McGrew.
I mind how they set up housekeepin', two young, poor, happy fools,
When Jim's only stock was a heavy truck an' four Kentucky mules.

Well, they lived along contented, weth their little joys an' cares.
An' every year a baby come, and twice they come in pairs,
Till the house was full of children, weth their shoutin' and playin' and squalls,
An' their singin' and laughin' an' cryin' made bedlam wethin its walls.

An' Jim he seemed to like it, an' he spent all his evenin's at home.
He said it was full of music an' light an' peace from pit to dome.
He joined the church, an' he used to pray that his heart might be kept from sin—
The stummlin, est, prayin', but heads and hearts used to how when he'd begin.

So they lived along in that way, the same
from day to day,
With plenty of time for drivin' work and a
little time for play
An' grow' around 'em the sweetest girls and
the liveliest, manliest boys.
Till the old gray heads of the two old folks
was crowned with the homeliest joys.

Eh! Come to my story! Well, that's all
They're livin' just like I said,
Only two of the girls is married, an' one of
the boys is dead.
An' they're honest an' decent an' happy,
an' the very best Christians I know.
Though I reckon in brilliant comp'ny they'd
be voted a little slow.

Oh, you're pressed for time! Excuse me!
Sure, I'm sorry I kept you so long.
Goodby. Now he looked kind o' bored-like,
an' I reckon that I was wrong.
To tell sech commonplace story of two
sech commonplace lives,
But we can't all git drunk an' gamble an'
fight, an' run off with other men's wives.

—R. J. Burdette.

AN ESSAY ON MAN.

Man that is born of woman is small
potatoes and few in a hill. He rises up
to-day and flourishes like a rag-weed,
and to-morrow or the next day the un-
dertaker hath him. He goeth forth in
the morning warbling like a lark, and is
knocked out in one round and two
seconds.

In the midst of life he is in debt, and
the tax collector pursues him wherever
he goeth. The banister of life is full of
splinters, and he slideth down with con-
siderable rapidity. He walketh forth in
the bright sunlight to absorb ozone, and
meeteth the bank teller with a sight
draft for \$357.

He cometh home at eventide and
meeteth the wheelbarrow in his path.
It riseth up and smiteth him to the
earth, and falleth upon him, and runneth
one of its legs into his ear.

In the gentle springtime he putteth
on his summer clothes and a blizzard
strieth him far from home and filleteth
him with cuss words and rheumatism.
In the winter he putteth on his winter
trousers and a wasp that abideth excite-
ment. He starteth down into the cellar
with an oleander and goeth backward,

and the oleander cometh after him and
sitteth upon him.

He buyeth a watch-dog, and when he
cometh home from the lodge the watch-
dog treeth him and sitteth near him
until rosy morn. He goeth to the horse
trot and betteth his money on the
brown mare, and the bay gelding with a
blaze face winneth.

He marrieth a red-headed heiress with
a wart on her nose, and the next day
the parent ancestor goeth under with a
fee, arrest and fireat liabilities, and com-
eth home to live with his beloved son-
in-law.—*Wichita County Democrat.*

HE SAW HIMSELF.

"You must excuse me, gentlemen, for
I cannot drink anything," said a man
who was known to the entire town as a
drunkard.

"This is the first time you ever refused
a drink," said an acquaintance. "The
other day you were hustling around
after a cocktail, and in fact you even
asked me to set 'em up."

"That's very true, but I am a very dif-
ferent man now."

"Preachers had hold of you?"

"No, sir; no one said a word to me."

"Well, what has caused the change?"

"I'll tell you. After leaving you the
other day I kept on hustling after a
cocktail, as you call it, until I met a
party of friends. When I left them I
was about half drunk. To a man of my
temperament a half drunk is a misera-
ble condition, for the desire for more is
so strong that he forgets his self respect
in his effort to get more drink. I remem-
bered that there was a half pint of
whiskey at home which had been pur-
chased for medicinal purposes. Just
before reaching the gate I heard voices
in the garden, and looking over the
fence I saw my little son and daughter
playing. 'Now you be ma,' said the boy,

and I'll be pa. Now, you sit here, and, I'll come in drunk. Wait, now, till I fill my bottle."

"He took a bottle, ran away and filled it with water. Pretty soon he returned, and entering the playhouse, nodded idiotically at the girl and sat down without saying anything. The girl looked up from her work and said:

"James, why do you do this way?"

"Wizzer way?" he replied.

"Gettin' drunk."

"Who's drunk?"

"You are, an' you promised when the baby died that you wouldn't drink any more. The children are almost ragged, and we haven't anything to eat hardly, but you still throw your money away. Don't you know you are breaking my heart?"

"I hurried away. The action was too lifelike. I could think of nothing during the day but those little children playing in the garden. You must excuse me, gentlemen, I cannot drink again."

THE DOORS OF THE BANK OF ENGLAND.

The Bank of England's doors are now so finely balanced that the clerk, by pressing a knob under his desk, can close the outer doors instantly, and they cannot be opened again except by special process. This is one to prevent the daring and ingenious unemployed of the great metropolis from robbing the famous institution.

The bullion department of this and other great banking establishments are nightly submerged in several feet of water by the action of the machinery.

In some of the London banks the bullion departments are connected with the manager's sleeping-rooms, and an entrance cannot be effected without set-

ting off an alarm near that person's head.

If a dishonest official, during day or night, should take as much as even one from a pile of a thousand sovereigns, the whole pile would instantly sink and a pool of water take its place, besides letting every person in the whole establishment know of the theft.—*Ex.*

BUILDING THE FAIR.

Busy Scenes at Jackson Park, the Site of the Columbian Exposition.

It takes a fence six miles long to enclose the World's Fair buildings. All these structures are to be of extraordinary dimensions, but the largest of them, on which the foundation work has just been commenced, will be something stupendous. It is the Hall of Manufactures and Liberal Arts. The site for this vast building is a broad, highly situated plateau overlooking the lake. A railroad track runs through its center, and on each side rise tremendous piles of lumber, iron and all sorts of construction material.

A similar scene is witnessed at the other great buildings, on which further progress has been made. Within the enclosure the Exposition site resembles one vast work ground, surrounded by freight cars and lumber yards. Looking out towards the lake, the breakwater, the long pier and foundation for the naval exhibit present the appearance of a mammoth dockyard.

Changed, indeed, is Jackson Park, and those who visited it three months ago would not know it now. A world's workshop, employing an army of builders, environed on three sides by the foliage and flowers of the south parks, and on the fourth by the infinite expanse of the lake.

The exposition site has undergone a

wonderful change since last spring. Then it was a soft marshy ground shelving in irregular stretches to the water line. Now it is a firm level, a smooth sandy surface upon a clay subsoil. A perfect and admirably improved building site. The hundreds of visitors who view the grounds cannot immediately appreciate the immense difficulties that have been overcome and the great labor involved in the earthwork accomplished on this lake shore site. It is now a level surface to the line of the lake, a surface a mile and a half in length, and, at its southern extremity, nearly a mile in width. This has been created, graded and leveled by constantly employing a small army of men and now, within the six miles of fence that surrounds it, the work of constructing the great buildings is being pushed with ceaseless activity.

From the slight eminence already known as "administration hill," which the lofty administration building is destined to effectively crown, the observer can even thus early gain a realistic sense of the distinctive features and general magnitude of this stupendous undertaking. At this point he is practically in the center of the sites allotted to the principal buildings and the system of terrace work which will surround them. He is also in the center of a complex network of railway track, 50,000 feet of it extending in every direction and connected with the trunk lines by fifty switches, all of them in constant use. This system of railway is laid upon what, four months ago, was wild park land untouched by the first improvement. The tracks are covered with cars, loaded with lumber, iron and every description of building materials. These roll into the grounds unceasingly and are switched up to the buildings to which the materials belong. Gangs of men

take hold with a will and as if by magic towering piles of material rise in every section of the grounds. Mounted superintendents ride from point to point urging things forward. The word is "rush" in every department and branch of construction.

The big buildings are beginning to rise. Already some of the principal structures are not only in evidence, but progress on them is marked from day to day. Looking northwest from the administration building the visitor sees the Woman's Building, already so far advanced that it looms up imposingly against its background of park trees.

Rising in the vista are the Electricity and Mines and Mining buildings, on which the foundations are already completed. Upon the sites of the Horticultural and Transportation buildings all preliminary work is completed, and hundreds of tons of material are ready to be placed in position.

Hundreds of men are engaged on every possible sort of construction work. Laying water-mains, electric-light plant, modeling for the exterior decorative work and developing landscape effects around the ornamental waters.

A busy place indeed is the exposition ground, and soon it will be as busy by night as by day for the electric lighting necessary for night construction has just been arranged for.

From one end of the grounds to the other everything is pushed, and that, too, in all sections of the work. In the landscape system, which includes the lagoons, basins and ornamental waters, the breakwater and lake shore terrace, the great pier and casino; in fact, all principal departments and even their minor divisions are being pressed forward with a business like ambition thoroughly in accordance with the impelling spirit of this gigantic enterprise.



Did you ever enjoy the luxury of a charming household paper that comes every *week*, at \$1.00 a year? There is but *one*. And it's a paper that is giving women everywhere a new sensation.

No FREE SAMPLES. Send two stamps for specimen number. And if you are so fixed that you could do some moderately-paying work for us at your home, compiling lists, addressing, etc., please say so.
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The *Housekeepers' Weekly* and DRAINAGE JOURNAL for \$1.50 a year, including an Art Portfolio—a collection of exquisite photo engravures in a rich case of white antique parchment. Send orders with the money to the DRAINAGE JOURNAL.

We are receiving the *Housekeepers' Weekly* as one of our exchanges and do not hesitate to say that the good ladies of the household will enjoy reading it, coming as it does every week. They

will find in it hundreds of practical suggestions which will not only interest them but be of much value in the management of household affairs.

Husbands that subscribe for it in connection with the JOURNAL, will pay, only half of the regular subscription price, and confer a favor on their wives. Single men will do well to subscribe for it, upon the terms offered through the JOURNAL and send it to their best girl. Try it and you will not regret the money thus expended.

PLEASANT EMPLOYMENT AT GOOD PAY.

The publishers of *Seed-Time and Harvest*, an old established monthly, determined to greatly increase their subscription lists, will employ a number of active agents for the ensuing six months at \$50.00 per month or more if their services warrant it. To insure active work an additional cash prize of \$100.00 will be awarded the agent who obtains the largest number of subscribers. "The early bird gets the worm." Send four silver dimes, or twenty 2-cent stamps with your application, stating your age and territory desired, naming some prominent business man as reference as to your capabilities, and we will give you a trial. The 40 cents pays your own subscription and you will receive full particulars. Address
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FOR SALE.

A Tile Factory—steam power—and ten acres of land. Good shed and kiln and very good house. Everything in running order.

1 t. p. WICKERS & BRO.,
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FOR SALE.

Having decided to quit the tile business, I offer my half interest in the tile factory situated at Mazon, Ills., for sale or trade for real estate. Business good and machinery and kilns in good order. For particulars, call on or address

B. W. COCHRAN,
Mazon, Ills., Box 50.

FOR SALE, AN EXCELLENT OUTFIT.

One Ohio Tile Machine in good condition as new—dies from 2½ to 12 inches—a 25 horse-power Engine, and a 30 horse-power Boiler and a Feed Mill that will grind from 30 to 50 bushels per hour. Will sell the whole outfit cheap. For further information address
3 t. p. GEORGE L. BONNER,
Dayton, Ohio.

FOR SALE.

Drain tile, all sizes from 3 to 24-inch. Special shipping rates. S. C. COWGILL, Summitville, Ind.

FOR SALE OR TRADE.

One of the best steam power tile factories in the gas belt. Located by R. R. Switch. Plenty of natural gas. Runs all winter. Everything in good running order. Will sell half or all the plant. JOHN W. RUST, Herbert, Grant Co., Ind.

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Plymouth, Ohio.

FOR SALE.

A saw mill—a merchant mill with top saw—two saws, one 58 inches and one 60 inches—the latter nearly new. A set of Atkins' Duplex patent Dogs, Cut-off Saw, Edging Table and saws, also Lath saw and table. It is a first-class mill in every respect except power. Timber can be bought at fair figures. This mill will be sold at a bargain.
Address, M. J. LEE, Crawfordsville, Ind.

FOR LEASE.

Tile mill consisting of 1 Brewer Tile Mill, capacity 10 M 4-inch tile per day, 2 Wolff Dry Kilns, Steam Dryer with cars complete. Each kiln holds 10 M tile. One 35 horse Atlas Engine. One 55 horse Steel Boiler for Engine and one 35 horse Iron Boiler for Dryer. Four Baking Ovens complete with Fire Brick; capacity 10 M 4-inch tile each. Lessee would have to furnish a Grinder. This property is located 73 miles south of Chicago and the entire output could be sold at the mill to the farmers. Will rent cheap. F. C. DEVENDORF, Receiver, 244 South Water Street, Chicago, Ill.

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Letter Heads, Bill Heads, Envelopes, Cards and Circulars executed neatly and promptly.

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Caution:—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—“Webster's Unabridged,” “The Great Webster's Dictionary,” “Webster's Big Dictionary,” “Webster's Encyclopedic Dictionary,” etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

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A Fact



The Perkins is the
Lightest Running Wind
Mill now made.

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After 21 years of success in the manufacture of Wind Mills, we have lately made a complete change in our mill, all parts being built stronger and better proportioned and a self-lubricant bushing placed in all boxes to save the purchaser from climbing high towers to oil it. The same principles of self governing retained. Every part of the Mill fully WARRANTED and will run without making a noise.

The reputation gained by the Perkins Mill in the past has induced some unscrupulous persons to imitate the mill and even to take our NAME and apply it to an inferior mill. Be not deceived; none genuine unless stamped as below. We manufacture both Pumping and Geared Mills, Tanks, Pumps, etc., and General Wind Mill Supplies. Good Agents wanted. Send for catalogues and prices.

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PRACTICAL FARM ECONOMY
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Over 100 miles of irrigating canals now completed, each from 18 to 60 feet wide and carrying 5 to 7 feet of water.

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Our farmers raise two crops a year of grain and vegetables, five crops of hay, and stock grazes out doors all winter. Our climate is a perfect antidote for consumption and all throat and lung diseases.

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Arrive in Chicago 7:55 a. m.	

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LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday.....	11:55 p. m.
Arrive in Indianapolis 8:35 a. m.	

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily.....	9:55 a. m.
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The FINEST TRAINS in AMERICA or THE WORLD.

Its SUPERB TRACK and UNRIVALED MACHINERY and EQUIPMENT permit the HIGHEST SPEED with PERFECT SAFETY.

It is the only line which lands its passengers at the GRAND CENTRAL DEPOT in the heart of the great city of NEW YORK, which is an advantage of NEARLY TWO HOURS in TIME OVER OTHER ROUTES.

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Its trains enter the Central Union Station, CINCINNATI; the Union Depots, CLEVELAND, BUFFALO and ALBANY; the Grand Central, NEW YORK; the Boston and Albany, BOSTON; the Union Depot, ST. LOUIS; the Union Depot, PEORIA; the Great Central Depot, CHICAGO; the Union Station, INDIANAPOLIS, and numerous others in the vast territory it traverses between the MISSISSIPPI RIVER on the west; the OHIO RIVER on the south; the GREAT LAKES on the north, and the principal SEA-BOARD CITIES in the east.

The Indianapolis Offices of this great line are located at

**No. 1 East Washington Street,
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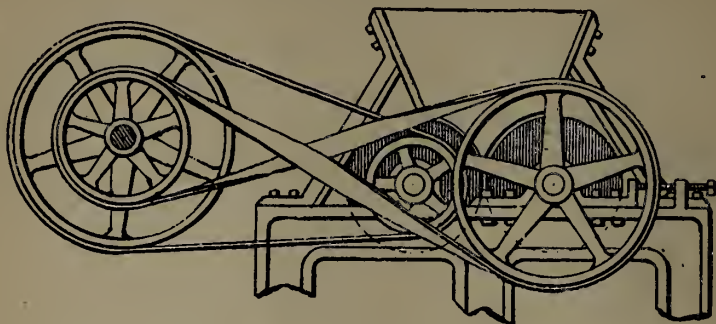
and the UNION STATION, where tickets can be procured to all parts of the UNITED STATES and CANADA and MEXICO, at the lowest current rates, and full information as to routes, conditions, connections, etc., etc.

OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

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The Crusher, Disintegrator and Stone Separator

PATENT APPLIED FOR.



Every machine warranted. Satisfaction or no sale. Will work lumpy clay where other crushers fail. After a continued and thorough test, it is believed by those who are using it that the Crusher and Disintegrator as above illustrated is superior as a Crusher, as a Disintegrator and Stone Separator. Requires less power to run it. It is not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Franklin, Ind.

ELEVATORS

FOR
CLAY, COAL,
ORES, SAND,
GRAIN,
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SECTION OF CONVEYOR.

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FOR TILE,
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Roller & Detachable

CHAIN BELTING,

Designed for

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BRICK, CLAY, TILE, CLAY, ORES, ETC.

Estimates for handling material of any kind cheerfully furnished. For '91 Catalogue and prices

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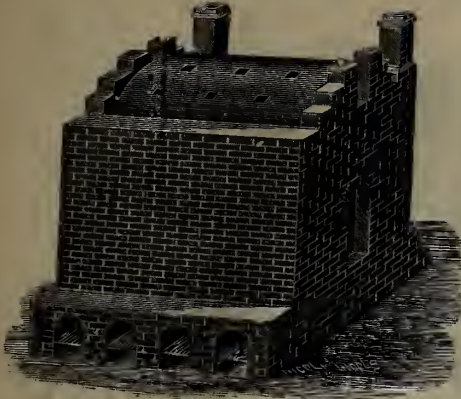
The Jeffrey Manufacturing Co.,

112 East First Avenue,
COLUMBUS, - - OHIO.



DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

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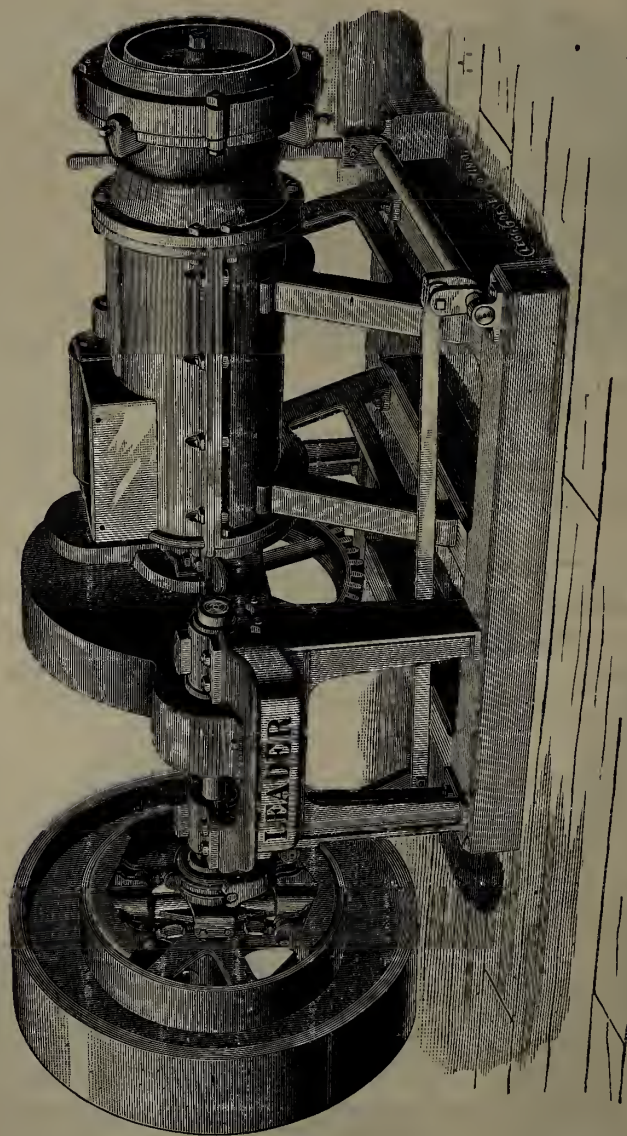
The Dredge Ditcher.

For Constructing Large, Open Ditches.



Manufactured by
MARION STEAM SHOVEL CO., - - MARION, OHIO.

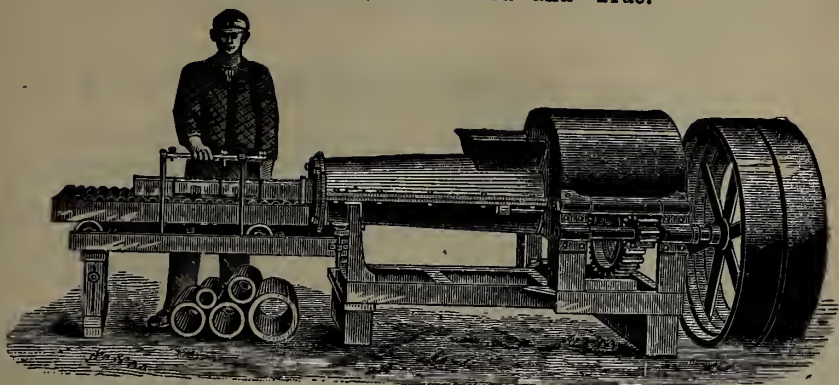
The Decatur Leader Mfg. Co., DECATUR, ILLINOIS.



Manufacturers of the simplest and best line of Brick and Tile Machinery on the market. Send for Circulars. **THE DECATUR LEADER MFG. CO., Decatur, Ill.**

KELLS & SON'S IMPROVED Brick and Tile Machines!

"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.

This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address



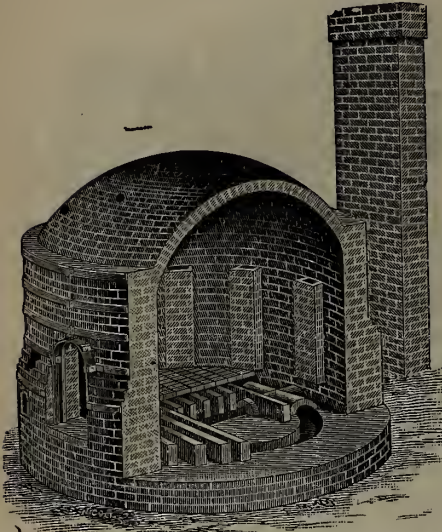
W. A. EUDALY,

CINCINNATI, OHIO

64 Johnson Building,

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT+LEADS+THE+WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect kiln—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

:-New and Improved Brick and Tile Kiln:-

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tilemakers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

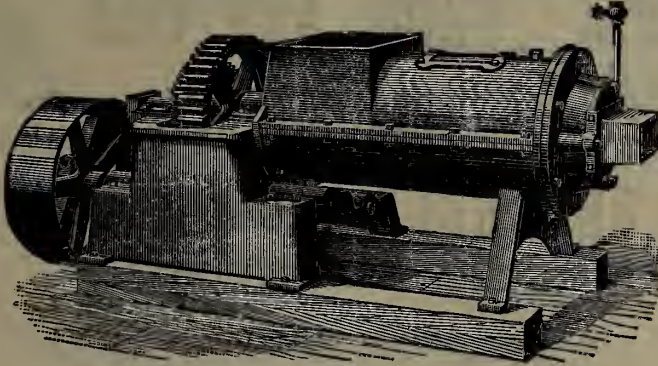
This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.



The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address

J. B. GRAWCOCK, Churubusco, Ind.

TIFFANY IRON WORKS, Tecumseh, Mich.



THE NEW CENTENNIAL

MAKES THE BEST

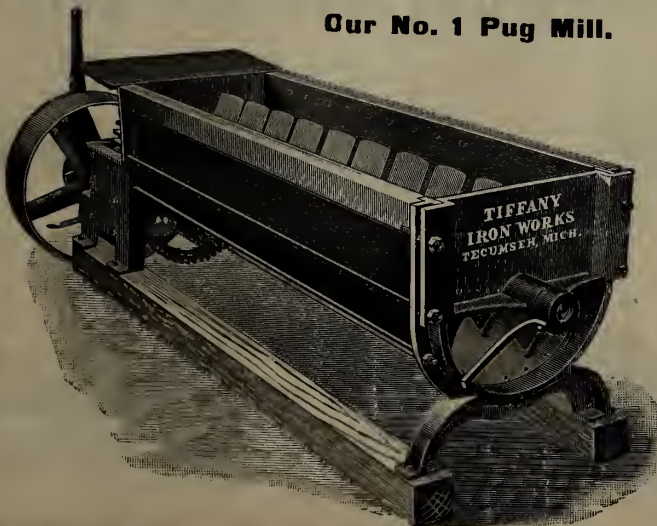
BUILDING BRICK, PAVING BRICK and FIRE BRICK.

CAPACITY FROM 20,000 TO 40,000.

No Seams or Laminations.

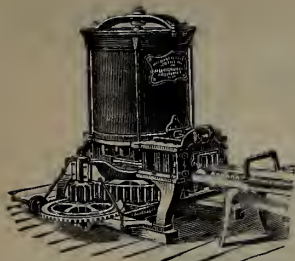
HOLLOW BRICK, ORNAMENTAL BRICK,
ALL SHAPES OF BRICK AND TILE.

Our No. 1 Pug Mill.



NEW AND SUPERIOR DESIGNS IN CLAYWORKING MACHINES.

PLANS AND ENTIRE PLANTS OF MACHINERY FURNISHED.



(No. 7 S Brick and Tile Machine.)

PENFIELD BRICK AND TILE MACHINERY.



(No. 2 E h.p. Machine.)

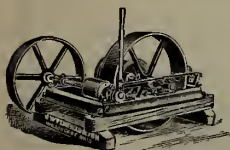
CLAY CRUSHERS, PUG MILLS AND ELEVATORS.

Dry Cars;
Clay Cars;
Turn
Tables
and
Kiln
Castings.

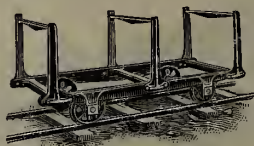


Pulleys;
Shafting;
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and
Yard
Supplies.

COMPLETE OUTFITS A SPECIALTY.



(Winding Drum.)



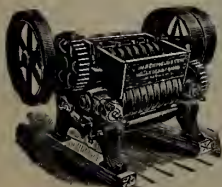
(Dry Car.)



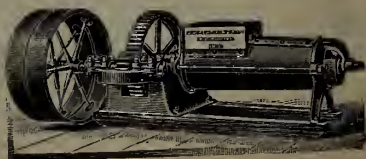
(Clay Car.)

J. W. PENFIELD & SON,

Willoughby,
Ohio,
U. S. A.



(No. 3 Crusher.)



(No. 7 Pug Mill.)

JAMES F. CLARK, President.
JOHN H. CAMPBELL, Sec'y and Treas.

Established 1856.
Incorporated 1891.

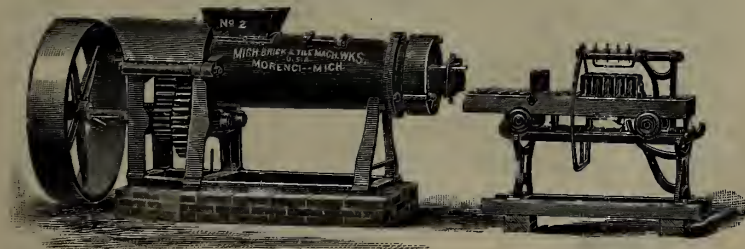
Michigan Brick and Tile Machine Company,

(INCORPORATED.)

MANUFACTURERS OF THE

Auger : Brick : and : Tile : Machine

They make better, stronger, more durable Brick and Tile (because they compress the clay ware) and turn them out at less cost (because they take the clay direct from the bank) than any other style of machine manufactured. We fully guarantee them and furnish them to responsible parties on trial before settlement.



No. 2 Brick and Tile Machine, with Side-cut Cutting Table—Curved Cut.

The above cut represents our smallest machine. Capacity 15 to 20,000 brick or 6,000 to 10,000 3-inch tile a day. A 10 H. P. Portable or Threshing Engine will run it. The price is low, buy one and make your own land tile, and some for your neighbors. You can also make all the brick you want, and very cheap. Why not save a lot of money

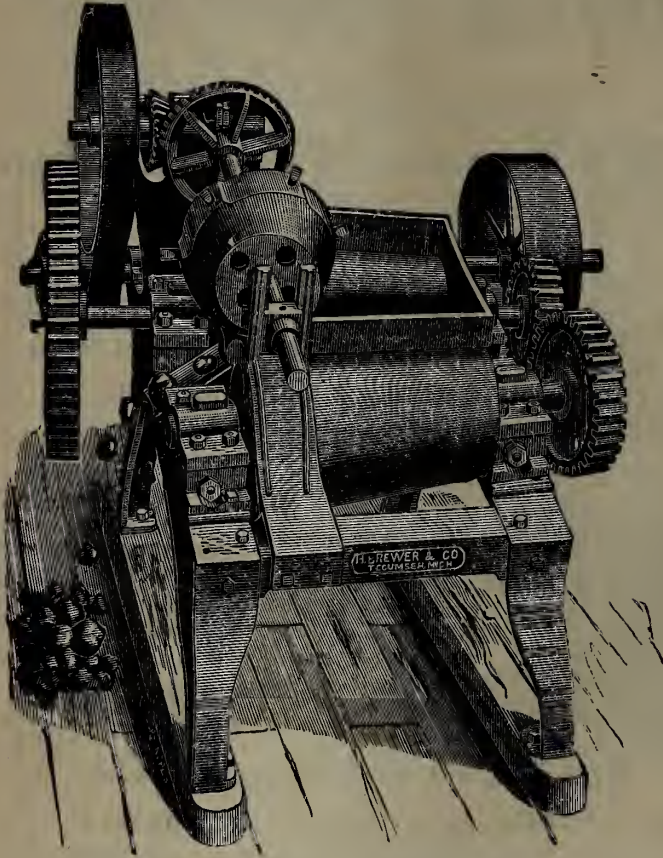
Send for Illustrated Catalogue.

MICHIGAN BRICK & TILE MACHINE CO.,

LENAWEE CO.,

MORENCI, MICH.

H. BREWER & CO., Clay Crusher and Stone Separator!



The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

PATENTED MARCH 3, 1885.

ADVANTAGES:

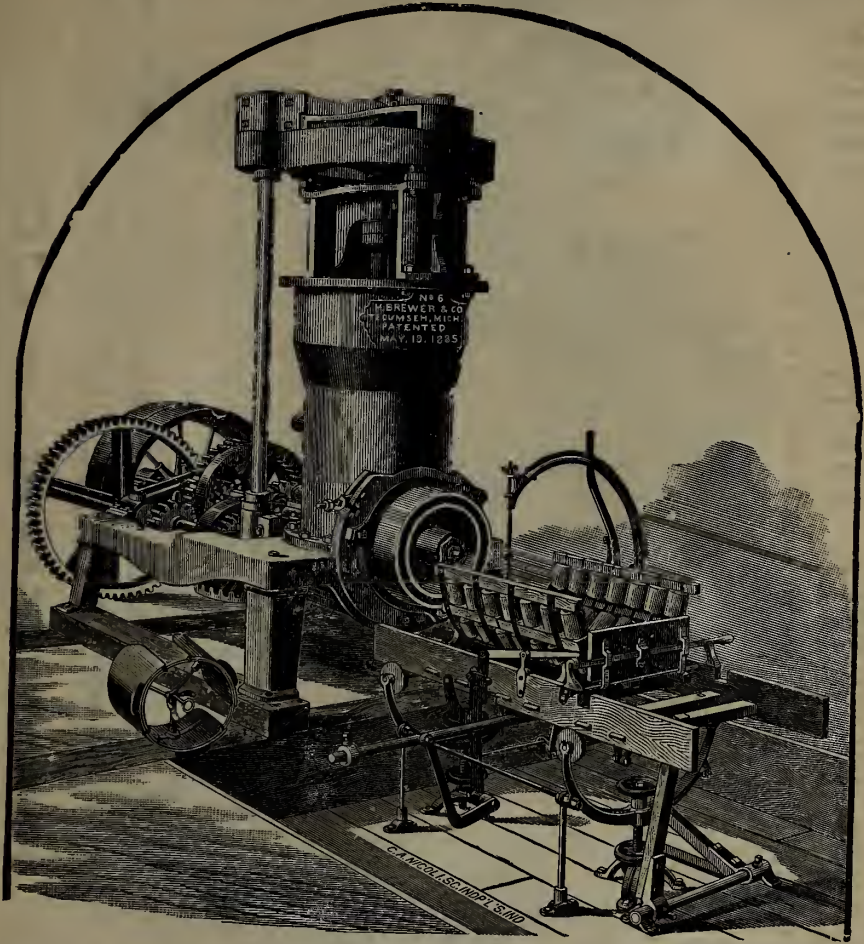
The following are among the advantages claimed for this form of construction:

- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
- 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
- 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
- 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
- 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
- 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
- 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
- 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

H. BREWER & CO.



H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently timed the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machines.

Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

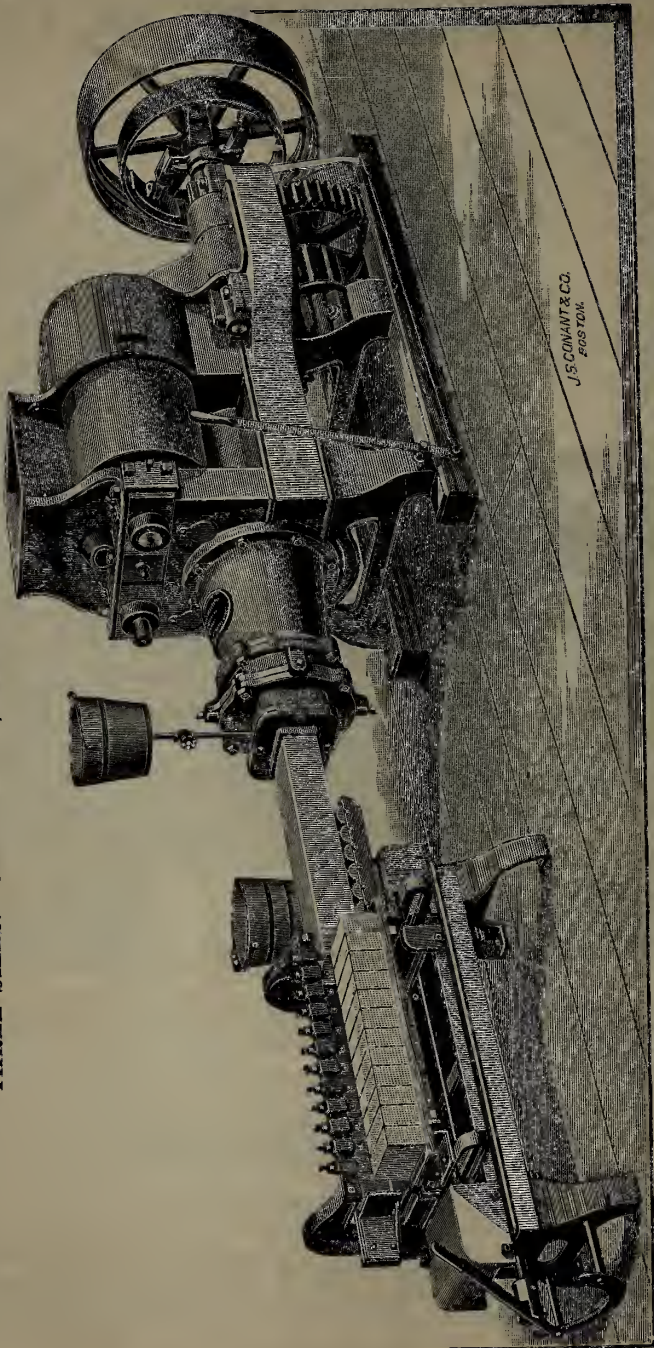
The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.

THE OHIO BRICK AND TILE MACHINES.

THREE SIZES. CAPACITY 10,000 TO 40,000 BRICK PER DAY.



J.S. CONANT & CO.
BOSTON.

"A" or Largest Size Machine with New Board Delivery Cutting Table.

Unequalled for the manufacture of Building, Paving and Fire Brick, Hollow Blocks, Drain Tile, etc. Satisfaction guaranteed.
For Catalogue and particulars, address

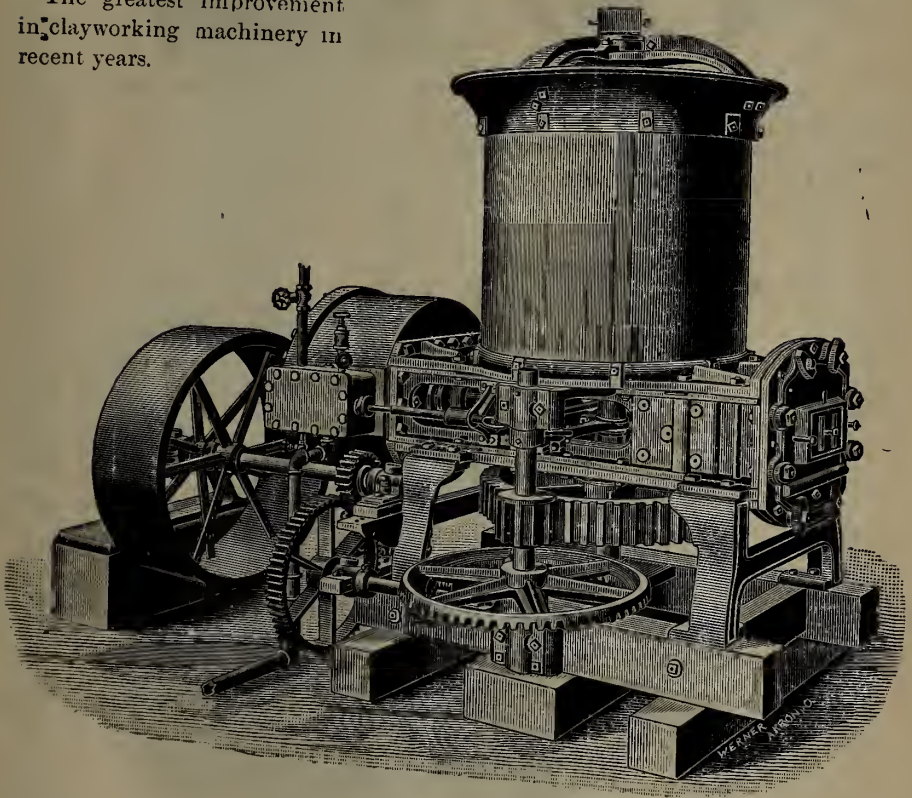
E. M. FRIESE & CO.,

PLYMOUTH, Richland County, OHIO.

[Mention this paper.

The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



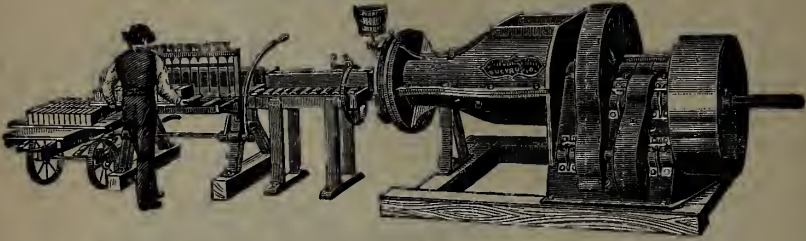
PATENTED APRIL 14, 1891.

For full information and circulars address

THE NEW BREMEN MACHINE CO.,
New Bremen, Ohio.

FREY--SHECKLER CO.

BUCYRUS, OHIO.



The Acme Machines—the heaviest and largest machines for tile or brick, terra cotta, lumber and hollow ware.

The Mascot—the lightest running.

The Centennial—the best clay mixer.

We furnish full outfits for brick and tile factories.

Engines, Boilers, Shafting, Pulleys, Belting, Winding Drums,
Dump Cars, Trucks, Wheelbarrows, Dry Pans, Cup
Elevators, Clay Elevators, Tile Elevators.



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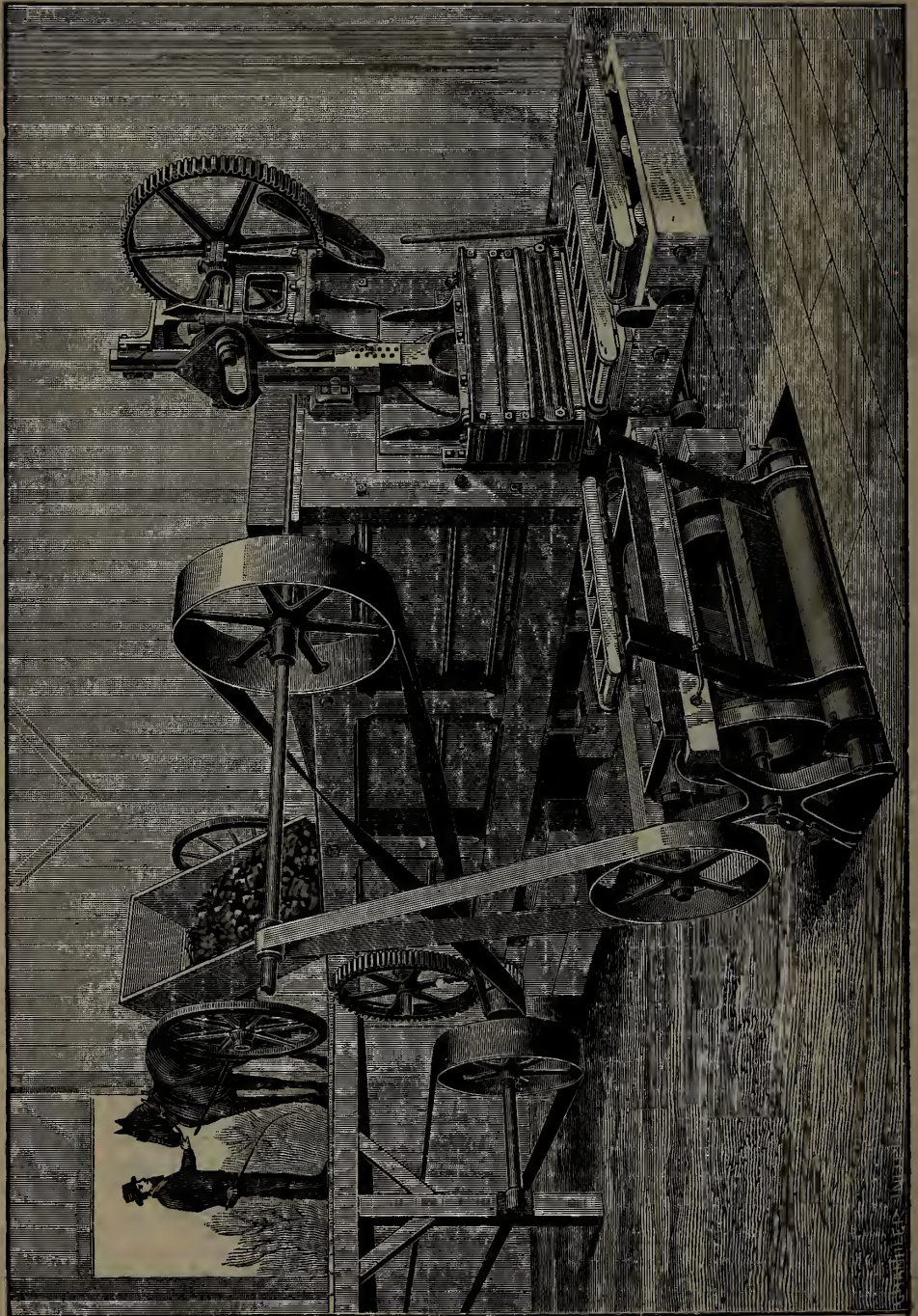


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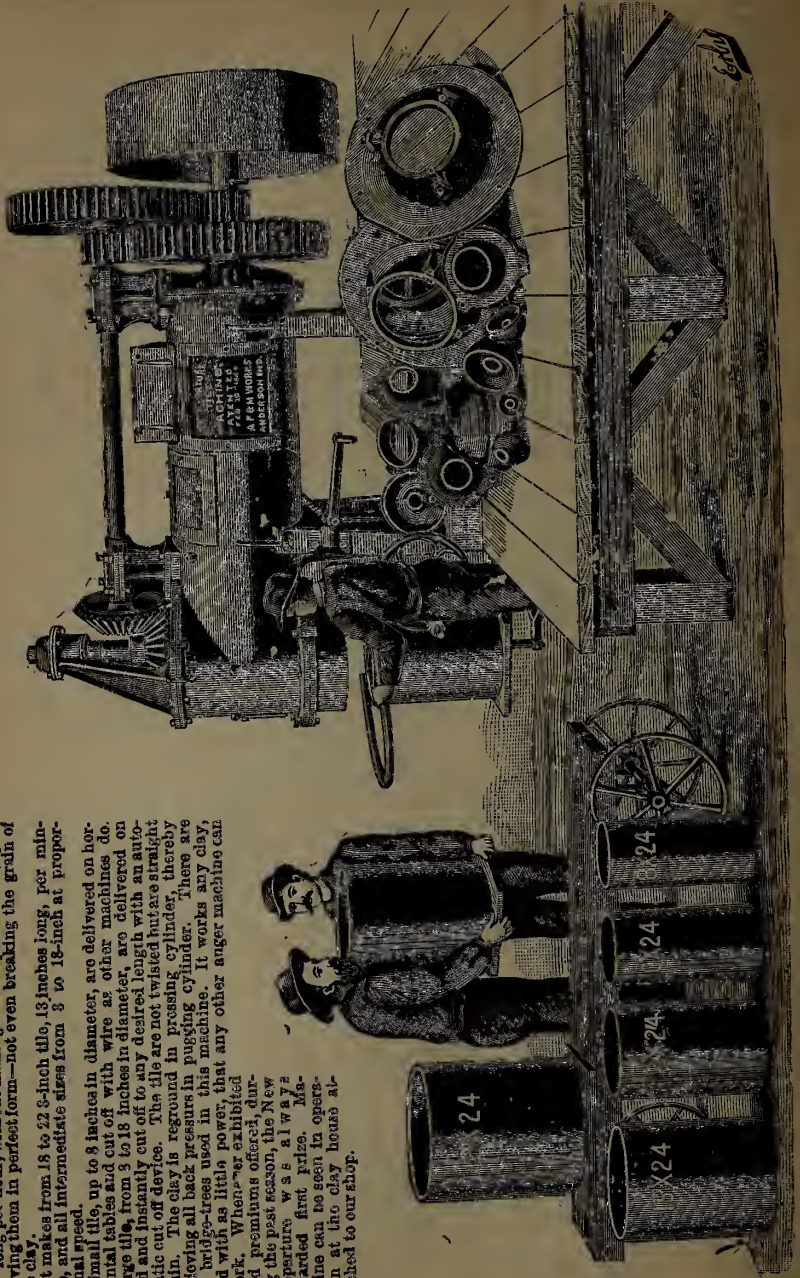
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THE DRAINAGE JOURNAL

DECEMBER, 1891.

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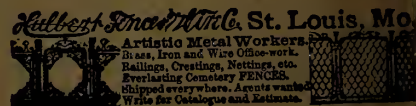
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THE DRAINAGE JOURNAL

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DRAINAGE.

The vast amount of money expended in drainage for the past forty years is a proof positive of its utility. To say nothing of what has been done in England in reclaiming and bringing into cultivation large areas of land that had been practically worthless all the centuries before. A brief history of drainage in this country confirms the fact that it not only pays, but in many instances it is the foundation of success in farming. The first record we have of drainage in the United States of America is that of John Johnston, of Western New York, who in the year 1835, began the drainage of his land. With him as with many others who have walked in his footsteps since that time, it was a matter of necessity. Being a Scotchman by birth, he was in some respects informed as to the benefits of drainage in his native country. Emigrating to this country, he invested his all in the way of money in the partial payment for a farm near Geneva, N. Y. After years of hard labor he found himself in debt, with a crop yield which was by no means remunerative. Being convinced that the drainage of his land would enable him to grow crops that would yield him a profit, he borrowed the money to begin the work, and progressed with the undertaking slowly but surely, until he laid over 50 miles of tile drains on his farm.

Mr. Johnston did wisely in doing thorough work. His neighbors had little if any faith in the outcome of his theories and for years he had a yield of 30 and 40 bushels of wheat per acre, when they had only 12, 15 or twenty. He gave the result of this experiment to the agricultural papers for publication, and leading farmers became interested in the work of drainage.

Now, after a period of more than fifty years, the lands which Mr. Johnston tile-drained are noted for their productiveness. Mr. Johnson died a few years ago, but the work of his head and hands will live on through the generations to come. The States of Illinois, Indiana, Ohio, Michigan and Iowa have taken the lead in drainage in the last quarter of a century. In part it has been a matter of necessity. The level, and, indeed, the best, lands for agricultural purposes were wet lands. The natural outlets for surface drainage were clogged with drifts, leaves and decaying vegetable matter so completely that the water was held back in its flow, overspreading large areas of country for months in the spring and summer seasons.

The early settlers secured the elevations, and those who came later were forced to take the level land. On what were called the table-lands, some of which are gently undulating, the natural outlets were wet and quaggy. There

was scarcely a quarter section of land that did not need more or less drainage to get rid of the excess of surface water. Open drains were made, but they were in the way in the cultivation of the land. Then under-drains, made of timber, were resorted to. They were put in shallow—often but little below the plow—but they were satisfactory. They removed the water and made it possible to cultivate the higher and lower lands together without much hindrance. Timber ditches were short lived—the best would fail in eight, ten or twelve years. The introduction of earthen tile about the year 1850 gave promise of more enduring work. The manufacture and use of drain tile has gradually increased, until they can be had at low prices throughout the States above named.

Perhaps no one, at the beginning of underdrainage, anticipated the extent of the use of drain tile that would likely be attained in the future. Those who pioneered the work, with few exceptions, were of the opinion that the work would be complete on their farms as soon as they drained the natural outlets and depressions or ponds. A field of twenty acres might have two or three or more muddy draws. The owner very naturally concluded that when these were tiled the work of drainage would be done. Consequently the drains were laid out to do the work as at first anticipated. Few, if any, took into account the water shed of the land, or, in other words, the amount of land that would naturally shed its water to the drain. If the arm of a wet muddy branch that led into a field, was only twenty rods long, though the natural outlet of the entire field might be through this little drain, it was commonly judged that a three-inch tile would do the work of drying up the wet land of the field, but

subsequent experience taught them a different lesson. The short three-inch tile drain made a great change in the soil; along the drain the soil was ready for the plow as soon as that of the higher land in the field. It was soon observed that beyond the land affected by the drain for the better, the soil was wet and cold. Some of the good farmers would say, "Since we put in that drain the water seems to hang in the higher ground." And it did. That is, water falling on the ground, not effected by the tile drain, had to pass off in part over the surface and into the soil and subsoil and get away by slow percolation and evaporation. The drains were usually laid so shallow that the effect of the underdrainage was hardly to be seen beyond two rods on each side of the drain, except in the removal of the water that flowed over the surface to the line of the drain.

The observing farmer soon saw that the drain must be extended to effect the land further up in the field; that other slight depressions needed arms or lateral drains, and so on, the outlines of more thorough work were forced upon practical farmers for consideration. When they began to extend the drains it was soon found that the first drain laid was too small to take the water of an enlarged system of drainage. To do the first work over was in a sense discouraging. Very many let the first drain remain, and laid out on ground near by a line for a main drain, sufficiently large to take the entire water shed that naturally found its way out through the outlet being provided. Slowly those engaged in underdraining had learned another important lesson, i. e., that shallow drains did not effect the soil to the depth desired. They have learned that the deeper the drain the deeper the soil and subsoil is made available for

plant food; that roots of the crops extend down into the earth to a depth of three or four feet if the drainage will admit of it. Also, that the deep drains effect the drainage to a greater distance on each side of the drain, the width drained depending upon the character of the soil and subsoil. If a drain laid at a depth of two feet drains thirty feet on each side, so as to relieve the soil of the excess of water in twenty-four hours after a heavy rain, a drain four feet deep and as well constructed in every particular will drain a space of fifty feet or more on each side, provided the soil and subsoil are alike. Further, that the water of heavy rainfalls will pass down so as to allow the stirring of the soil sooner in deep drainage than in shallow drainage. The soil being porous to a much greater depth, allows the water to pass down beyond the depth that the soil is cultivated, where it is drawn away to the drains.

Another lesson that has been learned in this connection is, that heat and air are necessary to plant growth; that the evaporation of the water from the surface keeps the soil cold; that air will not circulate through the soil when the spaces are filled with water; that the supply of plant food necessary for the growth of crops depends upon the air passing through the soil; that under-drainage removes the excess of water, admitting the air and heat necessary to the well being of growing crops.

These lessons, learned in most part by practical experience, have helped those engaged in the drainage of their lands to deepen and extend their drains until very many are approximating thorough work in this method of improving their lands. Howbeit, there are some that will have none of it, and others that have not learned how to drain, and probably never will for want

of brain power. But the advance has been very satisfactory where the need was general and the people ordinarily intelligent. The great stimulus to advance with the work is found in the fact "*that it pays to underdrain.*" Does anyone suppose that John Johnston was not elated at his success when he had forty bushels of wheat to the acre on his drained land when his neighbors had only fifteen or twenty bushels on land not drained. Or that Dr. Chamberlain was not elated when his yield of wheat went up from twelve and fifteen bushels per acre to forty or more bushels after he underdrained the land. Our limited space will not admit of the mention of hundreds or thousands of others who have been lifted out of the slough of despondency to a success that they had not dreamed of in farming, by draining their land.

There is one notable fact worthy of mention in this connection, which is, of the many thousands who have tile-drained their lands in this country and in other countries, not one has rose up to condemn the effects of drainage on the soil, in the better health of man or beast, or in the greater prosperity on account of it. A few pessimists have tried and continue trying to write down drainage, but the forces of reason and practical experience are against them, and have been in the old country across the water for a century or more, and in this country more than half a century. There are now in operation in this country over two thousand tile factories, many of them large and others being enlarged; some of which make two or three million tile a year. Other factories are in prospect in localities where but little has been done in the way of drainage.

There are yet large areas of land to be reclaimed that will be drained in the

near future. Further on we see in the vision that rises up before us, the low lands in the valleys of our great rivers, now in part covered with water, reclaimed and yielding an abundant harvest. But in the advance of the work the one prominent fact to be kept in view is, that the benefits to be had are in proportion to the thoroughness of the work. One or two lines of tile in a field of twenty acres that needs ten times the amount of underdrainage will not increase the yield of the entire field from fifteen to forty bushels of wheat, or from thirty to sixty bushels of corn. John Johnston, W. I. Chamberlain and others have had such success, but in every case it has been the result of thorough work, that of underdraining the entire field with parallel lines of drains three or four or five rods apart, and laid to the depth of three or four feet. And further, the work of laying the tile was well done, no haphazard or no method way of doing the work was allowed.

LOWER WATER LEVEL

The lowering water level of our great chain of large lakes and the smaller lakes has occasioned quite a good deal of theorizing as to the cause.

The cutting away of large areas of timber, the cultivation of the land, the underdrainage, and the dry seasons, etc., are some of the causes assigned. In the early settlement of the country the great forests dropping their leaves, the wild grass covering the prairies and marsh lands, the clogged streams, all contributed to hold back the waters of the rainy seasons, causing much of it to slowly percolate through the earth to find a way out in springs and seeps long after the rainfalls, thus supplying the small and large streams with an abundance of water. These streams, entering into the lakes, served to keep up the water level

to a point much higher than at the present time.

The forests have been cut away, much of the land has been brought into cultivation, the wild grass has given place to tame grass, less luxuriant in its growth and better adapted to grazing purposes, but hindering but little the flow of water over the surface, the compacting of the surface by cultivation and the tramping of stock, the construction of highways in all directions with side open ditches, the removal of all obstruction to the flow of water in streams, have all together facilitated the flow of water over the surface into the larger streams and away to the gulf and ocean. Now we have, with heavy rainfalls, high waters, rising and running down quickly. Old inhabitants will remember when the streams would run full for many days after the rains had ceased. Consequently the streams running flush with water, feeding our large and small lakes throughout the year, in the early settlement of the country, now pour in the waters of a heavy rainfall in a short time and then run low the remainder of the year, hence the water level of the lakes has gradually lowered, as the above condition of things have obtained.

With the change of conditions we have also a waste of fertility not experienced in the new settlement of the country, viz., the surface washing of the soil. The soil, by cultivation and the tramping of stock, has become compacted, and the water falling upon the surface runs off rapidly, carrying with it the silt and finer particles of soil, together with manures and decaying vegetation carrying these into the stream and away into the lakes, gulf or ocean, where the water is still, this treasure is deposited. This accounts in part, also, for the more shallow water in our lakes. While the water level is being lowered

the bottom of our lakes are being raised by these accessions of material washed from the surface of the land. A few writers have attributed the lowering of the water level to tile drainage, but it has had but little if anything to do as a procuring cause. To the contrary deep under-drainage serves to hold back the water, for without under-drainage the compact surface, with open drains along the roadways and unobstructed natural outlets for the water cause it to flow away rapidly. With deep underdrains, the open porous soil will take up the water of all ordinary rains, as it falls, and passes it down to the drain, the soil, subsoil and under stratas, taking up a large proportion of the water, permitting only the excess to pass out through the tile drains. The soil from the surface down to the drain will absorb water to the point of saturation. The amount of water required to wet the soil depends upon the character of the soil, the finer soils absorbing the greater quantity. If the underdrain is deep—three or four feet—it is evident that a heavy rain fall will be required to wet the soil down to the drain. It is true also that after the rain fall the surface soil will first be relieved of any excess of water so on slowly down to the drain, the water flowing in from the sides of the drain necessarily prevents a rapid lowering of the water level. So, in fact, the thorough under-drainage of the soil serves to hold back the water when compared to the surface flow. Where the underdrainage is sufficient to pass the water of an ordinary rain fall down through the soil to a depth of three or four feet, the drains will run water long after the open drains and small natural outlets for surface drainage have run dry.

It is a truism that if the water flow over the surface it will do harm; if it soak away through the soil it will do

good. It is also true that we underdrain to get the water into the soil as well as to get the excess of water out of the soil.

In conclusion, referring to the lowering of the water level of the lakes, the same is true of large streams, wells, etc., but the cause is not found in the tile or underdrainage of the soil, but to the cutting away of obstructions to the water flow, the surface water ways that have been constructed by man, and the compacting of the soil.

But after all, we are inclined to think that the inconvenience experienced in the failure of springs and wells will be a blessing, in the better health of man and beast, if we go down to the deeper veins of water for our supply. In traveling through the country we are sorry to see cattle and other stock compelled to wade through mud to get a drink of stagnant water covered with green impurities that have risen to the surface, or to look into a well, the water of which is so near the surface as to have a slickish taste.

The maker of the earth has wisely provided for deeper and better water, but few would go down to the better supplies of it were not for the lowering of the water level. We well remember the "arly days" when we had ponds and sloughs and ague and fever with yellow skins, and quinine and ague tonics covering our mantels. We don't want to see such days again. We greatly prefer to have an iron pipe driven forty, fifty or a hundred feet into the earth for good water and attach a wind mill to the pump and let the winds do the work of supplying man and beast with the best of water.

Right You Are.

We are entirely unable to understand all this talk about keeping boys on the farm. We have to exercise our wits to get ours off the farm long enough to get some schooling in the higher branches of education. Don't lean so heavy on the grindstone when the boy turns the crank.—*Ex.*

Farm Drainage.



CREVASSES AND TILE DRAINAGE.

One of the many objections which occurs swiftly to those who are unconverted to the tile drainage is this, that tile must fill up with sediment without fail, if a crevasse should happen on the plantation, or in the neighborhood.

I have once before given it as my opinion that probably the tile would not be injured in such a case, basing my opinion on the fact that I had seen the outlets, of many tile ditches temporarily submerged and that I had even seen from one to six feet of Mississippi water on a certain field of land near Carmen, Illinois (close to Burlington, Iowa), which was partly tile drained, and which partly belongs to myself.

I said in that articles that the tile came out all right after the water went down, and that the cattle browsed again in preference near the lines of tile, as they had done before. And I well remember the unbelieving smile with which at least one man referred to that passage in conversation with me.

As it happens the truth of my predic-

tion in regard to backwater from a crevasse has been proved this year on Messrs. Schmidt & Zeigler's Willswood plantation. After the back levee broke, the water stood on a good part of the tiled land for quite awhile, from one to two feet deep. As the tile are laid four feet deep from the start, the water was backed up into them the whole length, 1,200 to 1,500 feet.

Everybody conversant with such accidents will know that for a considerable time after the water went down the outlets could not be kept properly open, and that there was backwater for considerable time longer, as it is impossible to do everything at once, and the banks do not stand after the work is done.

In fact one of tile that empties into a ditch by itself was obstructed by fifteen inches of mud and backwater yet in the middle of October, when we commenced on the present work. And when it was opened at the mouth, the water running out of the tile filled an open ditch 1,000 feet long to a depth of three inches in an hour, and it kept running several days afterward.

If a crevasse should happen on a plantation itself that is tiled, and sand be deposited in the open ditches and on the land, the tile would again come out all right after the ditches would be cleared out. For the same outlet in the rear would be there. If there should be a deposit of sand formed on the land two or three feet deep, the planter would then have the advantage of drainage six to seven feet deep.—*F. L. Delfer in Louisiana Planter.*

DRAINS AND ROOTS

Drains often become more of less obstructed by roots, so that the water, if it passes through at all, runs only in a thread-like stream or in dribblets. This chiefly occurs in orchards and vineyards,

although any tree standing sufficiently near the drain may send its roots downward in the search for water, and work into the drain through a joint or slight imperfection in the tile.

A recent writer says that not long ago he was much annoyed by the gradual diminution of flow of water from a lead-pipe conduit of spring water, until finally it ceased running. On digging down not far away, and trying the pipe by a minute puncture, it was found full of water at full pressure. Then on uncovering the pipe toward the exit, or watering trough, he came where there had been transplanted into the soil over the line of pipe six years ago a plum tree. Here a root had descended in the two feet of soil to the pipe, and forced a very small growth of root into the pipe—perhaps there was a fault at the joint of pipe where it entered and from that a solid brush of rootlets wedged the pipe full.

Lead pipes have been known to be split open for a length of several feet by the roots of quack grass, which had found their way in through a small fissure, and by their continued growth forced the pipe open. Even beet-roots will penetrate tile drains and block them up. And it is related of such a drain being blocked up with what appeared to be a fine thread-like water plant. But on tasting the "plant" it was discovered to have the flavor of beet, and the mystery was solved. Several rows of beets crossed over the affected tiles, and had sent down their delicate rootlets into the drain in quest of water.

In the case of orchards and vineyards this is probably unavoidable, we know of no way by which the rootlets can be prevented from forcing their way into any weak point in the drain. But it may be well to avoid planting root crops that send out long rootlets over the drains.—

Mail and Express.

Agricultural.

CORN YIELD.

The November report from the Agricultural Department at Washington says the general corn yield is 26 bushels per acre.

The highest rate of yield, as estimated, appears in New England, from 35 to 40 bushels per acre; in the South the range is from 11 in Florida to 25 in Maryland, while in the surplus corn States the figures are as follows: Ohio, 33.7; Indiana, 32; Illinois, 31.2; Iowa, 36.7; Missouri, 29.9; Kansas, 26.7; Nebraska, 36.3. Frost in August wrought some injury in the Northwest; in Wisconsin the yield is 26.7; Minnesota, 26.5; North Dakota, 27.2. Both drought and frost conspired to reduce the yield in South Dakota to 22 bushels.

Much of the crop is yet in the stack, and its condition and rate of yield may be better known after garnering and marketing, yet it is evident that the product will not be less than 2,000,000,000 bushels, or 31 bushels per unit of population.

Wheat, 64 per cent. was winter and 36 per cent. spring. Estimated yield 500,000,000 bushels.

Potatoes, 230,000,000 bushels, the largest ever known in the country.

EUROPEAN REPORT.

Sir J. B. Lawes estimates the yield per acre of wheat of the United Kingdom for 1891 at 30 bushels, and the amount which it will be necessary to import at 160,000,000 bushels. Wheat sowing in France has been interfered with by heavy rains, but is now progressing favorably. The German potato crop turns out better than was expected and slightly better than last year. Drought in Austria-Hungary is interfering with fall work. Fall seeding has progressed fav-

orably in Russia except in the famine districts, where the general demoralization interferes with all work in spite of favorable weather conditions.

FERTILIZERS, PLANT LIFE, FERTILITY OF SOILS, ETC.

Mr. Josiah Hoopes refers to the necessity of keeping a surface topdressing about ornamental trees while they are young and in open ground. An exchange paper prints an argument in favor of humus as the safest and best dressing for farmers' fields. It is called 'good food,' while commercial fertilizers are classed with patent medicines, as often doing positive harm, and in some combinations which they are liable to form in the soil, destructive all around, like the Kilkenney cats. These and similar expressions, occasionally met with, indicate a return to nature's method of imparting and retaining fertility to soil. After years and decades of attention to the dicta of scientific teachers, with their 'Lo, here!' and 'Lo, there!' it is a comfort to leave their bewildering books and to find out in one's woods, all around about in the cool shades, a plain and practical solution of the important question, how to preserve and increase fertility of the fields. The savants do not accept this solution. It is perhaps too plain, too simple—too much after the manner of Elisha's requiring the mighty commander, Naaman, to wash in the river to be cured of his disease. They tell us there is nothing in humus—plain vegetable mold—that plants are capable of absorbing. But every observant farmer knows that if he has a good firm loam, with drainage under it and a coating of well-aired and sweetened humus over the surface, he can count with assurance on healthful and perfect growth by merely keeping all robber plants away, protecting from damage

by storms, animals or insects, and supplying water if severe drought occurs during the season of growth. He knows too that this humus becomes used up unless often reinforced with material. The plow, which has been the type—the emblem—and boasts of our Western agriculture, will give way to the simple coulters or scarifiers, which thoroughly stir the ground without reversing it and burying the natural and fertilizing surface under bare, inert subsoil. The plow must still be used for shearing off and destroying perennial weeds, and should run as shallow as will serve to effect this killing, keep the surface on the surface stirred as much as possible. But while we should depend on nature's own course for the success of plant-culture in general, artificial manures are capable of giving assistance either in correcting injurious qualities in the soil or by reinforcing the nutritive elements contained in it. We must, however, not forget that they may be applied wrongly, and do harm instead of good. The only way to find out is to put the question to the soil itself and to the crop we propose to grow, by trying samples of known strength; and of sorts—as nitrates, potash, phosphorus and others—and checking results by comparison with a strip left wholly untreated.—*New York Tribune*.

A DEBT PAYING YEAR.

From all parts of the country come indications that this is to be a debt paying year. Farmers are canceling their mortgages. This is right—let the surplus from good crops free the farms and homes from wearying incumbrances. But what will capitalists do with the money. Already money is being advertised to loan at reduced rates of interest, but we hope that no one will borrow except as a matter of necessity.

BETTER GRASS, BETTER COWS, BETTER MILK.

"Commissioner Tupper tells the people that two-thirds of Iowa butter is not gilt-edged. If we had some one of equal force to tell them that nineteen-twentieths of their pastures are away below sufficiency he would be the man for the times. A million cows would say so, if they could speak our language."

The above paragraph is to the point, except it does not go far enough to tell the whole truth. There is a common opinion among those who handle stock that grass is grass; that a pasture that grows about half and half tame grass and water grass is good enough.

Water loving grasses may grow luxuriantly and look well, and, at the same time, be unfit for pasturage. Stock will graze on such when they are starved to it. Quite recently we passed through a pasture that looked well from the outside but upon closer examination we found that much of the grass was mixed about half and half with blue grass and wild water grasses. To crop the grass at all the stock were compelled to take the bitter and the sweet together. Further, we came to an underdrain that had been run through the lowest ground in the field, and there we found a good blue grass sod, which had been grazed as short as a goose pasture, and, at the same time, a few rods away the grass was almost untouched, except straggled down a little as if the stock had been in search of a palatable spot. The one drain was all there was in a field of probably 15 acres, and along the line of the drain the stock had evidently subsisted.

And this pasture field is no exception. We have in mind a large grass farm that is prized highly by the owner, that does not furnish the grazing that half of the same land would, if the wild, rough and woody grasses were exterminated. But

no one can make him believe it. He points to his grass, growing luxuriantly, and, at the same time, the cattle (about one to ten acres) go gleaning for a mouthful of grass here and there, except on dry spots where it is kept down to the ground.

The truth is, many are slow to learn that an acre of good, clean, tame grass is worth more in grazing, to make fat, to make growth, to make milk and butter, and better milk and butter than five acres of pasture, the half or two-thirds of which is unpalatable and unprofitable.

How often do we hear the remark, referring to low, wet land: "It is too wet for cultivation, but it will do for pasture." Practically, low, wet land, is unfit for pasture until it is underdrained, and then it is no longer wet land. Good grazing land is also fit for cultivation. If it will grow good, nutritious grass, it will grow corn. Again and again the need of good feed to produce good cattle, good milk and butter, and fat animals, has been urged through the press and in public meetings, and everybody seems to think it is so, and yet what a large proportion of the pasturage is only fit to keep the live stock in a starving condition.

Again, how frequently do we hear it stated that certain low lands are needed for pasture and need no tile drainage. There is no greater mistake. If the land needs draining for cultivation, it needs it for pasture. A well drained field that will grow good crops, is the best of pasture land when sowed to tame grasses. The grazing of the stock will be general, and the grass sweet and nourishing.

Further, is it not true that well underdrained, fertile land, will yield as large, or a larger return for the labor expended, and money invested, for grazing purposes, than if cultivated in ordinary cereal

crops, and improve in fertility rather than otherwise?

By thorough drainage every foot of the surface can be made available, covered with the sweetest grass, without any mixture of quagmire or water grasses, to embitter the taste. If the grazing ground is low and covered with bad grasses, with a little mixture of tame grass, drain the land by all means—make it as dry as if it was to make a garden, the drainage will kill out the water-loving grasses and weeds. It will pay, for the reason that when well sodded it will graze two or three times the number of live stock and furnish them with the best food for growth, for fat and for milk and butter.

ALSIKE CLOVER

Alsike clover as a crop of itself is scarcely ever a paying one, unless it is on a swampy piece of ground that will not produce anything else; but as a thing to have on a farm mixed in with all the pastures, all the meadows, all the fence corners, and on the waste land, from the rich swamps to the poverty stricken hill tops, and everywhere else where there is a square foot of land—it is one of the best paying growths that I ever had on the farm. It comes to stay. It does not die out, is of slender growth, cures out very quickly, and adds very much to the quality of hay. It is never in the way or interferes with other crops, and is very easily got rid of by cultivating the land. It produces a large crop of seed on the first growth, and the hay is never dusty or musty like red clover. Its qualities are all good; none are bad.

The only thing against it as a crop alone is that it don't produce enough. It is too light, but of the very best quality as a hay. There is nothing equal to it as a bee pasture, producing the very

best of honey and plenty of it. It continues in bloom longer than anything that I know of, and for fertilizing purposes it is equal to the red clover. If you give it a trial you will not get rid of it. I got a quart of the seed about ten years ago, and never tried to save any seed except from the sweepings of the barn floor. It has spread over several hundred acres.—*S. J. Woolley in Germantown Telegraph.*

TEN JERSEYS KEPT ON SIX ACRES.

A Kentucky correspondent of the "*Mirror and Farmer*" says: "I kept ten head of Jerseys and one horse on a six-acre farm in this way, which perhaps will be a help to some one who wishes to have cows and thinks he has not land enough. I first sub-soil my ground as early in spring as possible by running one plow after another, covering up as near as I can the dirt thrown over by the first plow with the dirt that is thrown over by the second plow. Then I harrow the ground well and plant first two acres of sweet fodder corn in drills two and one-half feet apart. I plant soon after two acres of our common white corn in rows three feet apart each way, and the other two acres of timothy and clover I cut for meadow. This I cut just as it is coming into good bloom. I commence feeding my sweet corn when four feet high, and when I have fed one acre I plow and harrow the ground and plant as I did the first sweet corn, still feeding on my next acre. I have a medium-sized stable and cut the fodder with a hand power cutter just as the corn comes from the patch, and I find it a great feed for any kind of stock. After I finish feeding my sweet corn I feed on my common white corn until about September 15th of each year, then I commence feeding on my second crop

of sweet fodder corn. I feed on this until frost. I sow the four acres with rye the first of each August. This rye gives them a great deal of pasture through the winter, and with buying a little hay and bran through the winter I keep my stock in good fix all the year. I forgot to state that I have for them to run in a good stable lot, with a large spring branch, on the bank of which stands a large elm tree which Daniel Boone shot the Indian out of at the time when my grandfather was in the old fort called Harrod's Fort. The Indians made an attack on them at this fort and the white men pursued them as they were making for the big spring, which is only about 200 yards above the large elm tree where the Indian was shot. This spring is only thirty feet above my line of fence, and it runs down through all of my feeding lots and furnishes me with plenty of water for my Jerseys. There is also at this spring the stump of a large tree, under which the first Baptist sermon was preached in Kentucky."

FARMERS PROSPECTS.

The future prospects of the agriculture of the country have hardly been so promising for many years, if ever before. First of all, God has blessed us with crops of great abundance. It is a satisfaction to grow good crops at any time, even when prices are low. And to have a great abundance with a demand that promises to take our surplus is far better. Through the wisdom of our rulers and the necessities of foreign governments we have had large markets opened to us where we can dispose of our surplus products. Germany, Denmark, Italy and France, by agreement, have already opened their ports to our hog products.

Cuba has removed the restrictions on American lard. The outlook for the grain product is alike promising. Our exports are far in excess of our imports. When the balance of trade is so largely in our favor, with the prospect that it will be increased for hogs, cattle, sheep, horses and cereals, does it not behoove us to take advantage of the times and grow the best of everything.

PROVERBS ON THE FARM

Use diligence, integrity and proper improvements of time to make farming pay.

Do not have more live stock than you can keep well.

House all things as much as possible—animals, utensils and crops.

When you are offered a fair price for your produce do not store it for rats and speculators.

The more comfortable you can keep your animals the more they will thrive.

A good cow is a valuable machine; the more food she can properly digest the greater the profit.

A few roots daily to all the stock are as welcome as apples to boys and girls.

Iron shoes on sleds last a lifetime and are cheaper in the end than wooden ones.

Replace the bars where you often pass by strong gates, and then wonder that you did not do so before.

Although in draining land thoroughly your purse may be drained, yet the full crops that follow soon fill it again.

Always give the soil the first meal; if it is well fed with manure it will feed all else—plants, animals and men.

A borrowed tool if broken should be replaced by a new one.

A sense of honor in such matters is much to be commended.—*Western Farmer.*

FINGER BOARDS AT THE FIVE POINTS CROSSINGS.

Don't have a mosquito hatchery and a fever breeder at the kitchen door. Buy a barrel cart, and cart the slops to the manure pile.

The average man can make more money by knowing how than by large capital.

We are putting up a full two years' supply of apple-butter, and dried apples and the like, at our house. Maybe next year apples will not be so plenty.

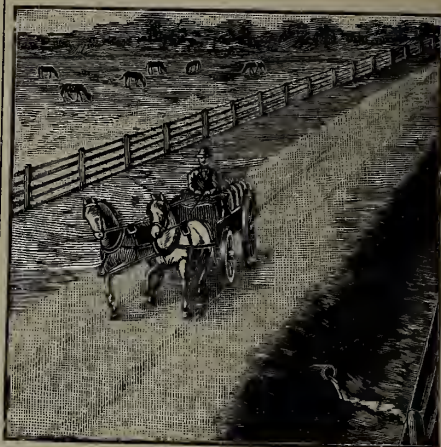
How often we see a man making a better living on twelve to twenty acres than another equally industrious on a hundred or more. Could not I do more with less land?

One reason why kitchen help is so hard to get and keep on the farm is that most farmers are unwilling to pay for such help what it is actually worth. That may startle some, but it's true.—*Sel.*

ALL IN AN EGG.

A raw egg, if swallowed in time, will effectually detach a fish bone fastened in the throat, and the white of two eggs will render the deadly corrosive sublimate as harmless as a dose of calomel. They strengthen the consumptive, invigorate the feeble, and render the most susceptible all but proof against jaundice in its most malignant phase. They can also be drank in the shape of that "egg flip," which sustains the oratorical efforts of modern statesmen. The merits of eggs do not even end here. In France alone the wine clarifiers use more than 80,000,000 a year, and the Alsations consume fully 30,000,000 in calico printing and for dressing the leather used in making the finest of French kid gloves. Even egg shells are valuable. for allopath and homeopath alike agree in regarding them as the purest of carbonate of lime.—*London Standard.*

Road Drainage.



IMPROVING COUNTRY ROADS.

The average country highway is not a model affair for the use of anybody, least of all for the farming community that travels over it the most and suffers from its defects. Saying nothing about the general uncanny appearance of the roadside as a prolific seeding ground for thistles, burdocks and noxious weeds of all sorts, or a dispository for stumps, stones and rubbish of every kind, the condition of the road bed is far from what it should be. Too often indifferently built in the first place, its subsequent use and poor repairs speedily serve to reduce it to a wretched condition. Rainy weather soon aids in sprinkling its surface with holes of various depths, and plowing it full of ruts which remain during the dry and settled portions of the year to obstruct good traveling, and tear wagons and harness to pieces. Smaller loads must be carried, and rapid motion is out of the question.

Such roads are vastly unprofitable. Double the load can easily be transported over a fairly smooth road that a poor highway will permit of. That

means two trips for the farmer instead of one, with the consequent loss of time for man and team, while the wear and tear is at least four times as great. Foot up such a loss as that in the aggregate of a township's farming population and the result will be something astonishing. But it never is footed up, and the farmers go pounding along over their uneven roads year in and year out, with scarcely an improvement. How much better is the average country road now than it was half a century ago? Not much. And yet in all that time it ought to have been growing better and better with each year's labor applied to it, until now it should be almost the perfection of a splendid highway.

The farmers of Pennsylvania are at last awake on this subject. They have come to realize how expensive bad roads are, and that it is money in their pockets to spend time and labor for their thorough improvement. A citizens' road association has been organized, with a university professor at its head, who are stirring up the farmers in all parts of the State by disseminating useful information as to the proper construction of roads, and pointing out the losses entailed by reason of the wretched facilities afforded them in getting their products of all sorts out to market. This association has now prepared the draft of a law which they will present to the coming Legislature, to help on the good work in which they are engaged. This plan provides for the election of the road commissioners in each township, who shall be kept as far removed as possible from political and pecuniary influences. They are to appoint road masters to act as superintendents over all work done by farmers who pay their road tax by labor—and that means the most of them. Every farmer desiring to work out his road tax must notify the com-

missioners before May 1, and the road-masters will then give him notice when and where to do his work, and their directions must be followed. If the farmer fails to appear at the designated time, others will be hired to do the work, and the delinquent must pay his tax in money. It is believed that this will result in dropping the slovenly and half-way method of working out a tax, because farmers will be subject to be called out when they may be in the midst of important work, and they must promptly respond to the summons. The work is to be done at the most favorable time for making a good road, and not at the farmer's convenience. Then the being obliged to work under a superintendent's direction and to obey his orders will be far from agreeable to most.

But in order to make the paying of the tax, whether in money or labor, more acceptable, this proposed law provides that, for every mile of highway built after a permanent fashion, with stone or gravel foundation and proper drainage, the same being subject to inspection and acceptance by the commissioners—the county shall build in that township another mile of equally good road, and the State still another. Thus a community can secure three miles of good highway for every one it builds itself. The object of all this is to secure substantial and permanent work, and there seems to be a fair promise that this might be accomplished under this plan.

This scheme would increase county and State taxation for a time if it were generally carried out, and all the large cities and towns would have to contribute their share toward it. It is a move in a much needed reform, and deserves attention. [This proposed road law failed to pass.]—*Detroit Free Press*.

OLCUT-ISMS.

From the Connecticut State Reports.

The object of a bar on a road is not to stop travel, but to turn water. Some road menders fail to realize this distinction.

It is not footpads who rob on the highway—shameless road menders do it.

The road-maker's business is to make better wheeling or let the roads alone.

A more durable and perfect surface could be given by the teams delivering stone if they run on six-inch tires, as all heavy-loaded vehicles ought.

Garden rakes are no good in gravel work, they take out too fine pebbles.

It is poor gravel and bad work which makes no road to ride over.

Gravel can't well be too stony for this class of work, with the big stones combed out of the four top inches.

A good road needn't be as wide as it is long. Countrymen should get their heads clear about that. Eight feet wide and three feet deep in the center will hold some of your rocks and perhaps be wide enough.

If people would build more stone roads and less stone walls they would be richer, unless poor roads come to be our cheapest protection against thieves and robbers.

Repairs will be very light when taxpayers see that a road thoroughly built in the first place is one of the chores of a life-time.

We have a lot of road-menders who are not ashamed to lay down onion beds, for mellowness, in the highway. Coal ashes can be laid in mud and made as solid as plank under the tread of broad cart wheels.

The work of bad road-menders is often worse than if it had never been done in the disgust it brings upon the public and the decay it brings upon the life of

the town and state in the matter of public spirit.

Gouging into foot paths and cutting down every man's entrance may let the public go its way fairly well for awhile, but it does not tend to the growth of public spirit along the highway.—*Grange Homes.*

BETTER ROADS IN IOWA.

Prof. James Wilson in the *Daily Republican*, Cedar Rapids, Ia., says:

There has been a great change of late in Iowa, in roads. The road graders shape the highways and a larger per cent. of the road tax is required in money. The townships have also been laid out in larger districts, giving more scope to road plows. Iowa has not stone or gravel to make roads, but when they are properly underdrained and rounded to shed off the water we have the best roads, taken all in all, of any country we ever saw except when frosts are just coming out. We hear much of the fine roads in Europe, but they are only main thoroughfares. The country roads abroad are very indifferent.

Just imagine a single acre under perfect control; well drained, heavily manured, closely planted, thoroughly cultivated and in dry times entirely irrigated! Surely there would be a big crop and little time and strength wasted in travel.

The opening of diplomatic relations with Chili through their minister now at Washington, will probably enable us to settle all questions with their new government satisfactorily.

Many of Balmaceda's followers are to be exiled from Chili. They are said to be very undesirable immigrants.

Tilemaking.



TILE OUTLOOK.

The past season has been especially favorable for the manufacture of drain tile. The weather has been favorable for both drying and burning. The sales were favorable in the early part of the season. The continued dry weather in the latter portion cut the sales short, so that many tile yards are supplied with a full stock. But they will likely be in demand before the birds sing again. The very prosperous outlook for business of all kinds will encourage those who need to drain their land to go at it in good earnest. With the very promising prospect for a demand for all of our surplus products at good prices, every enterprising farmer will feel like putting his land into the best possible condition for growing good crops.

There are very few farms that do not need more or less underdrainage. The stimulus of coming prosperity will put new energy into many men. In this connection we will suggest that tile manufacturers take advantage of the times by sending out circulars and drainage literature as a reminder of the

advantages to be had by underdrainage, and urge the drawing of the tile during the winter months when the ground is frozen, that by so doing they will save much valuable time in the spring and forward the work of drainage; that by drawing the tile in the winter, when the roads are firm, they will have an opportunity to make better selections of tile and get the better benefit of the drainage, and for the further reason that the weather may be favorable at some time during the winter to put in the tile, and the work being done early in the season the land will be the more benefited the coming season. A little work wisely done along the line we suggest may greatly increase the sales and prove a benefit to both parties. We know it is best for those that use the tile, for we have tried both ways.

MAKING IT PAY.

If some of our readers have made more tile than they are likely to sell for the next two or three months, don't sell them at a loss; rather hold them. They will not decay, if well burned. Rick them up orderly, clear away the bats (if there are any) and remove the rails and poles, and right up the premises, so as to give them a business-like appearance, and then see what can be done to increase the interest in tile drainage. Go to the managers of the farmers' institutes, or the local farmers' organization, and have "farm drainage" put upon the programme for a paper and for discussion. Send out some drainage reading matter to those who need to drain their lands. Go to some of the leading spirits and talk up the benefits as tree peddlers do their fruits, or as live stock growers do their stock, and with earnest effort you will be surprised what a great fire a little matter will kindle.

This is but common sense. It is a

sign of brains. It turns defeat into victory. It is far better than running your hands down into your breeches pocket and yawping about hard times, no money, etc. It is better than whittling a goods' box at the corner grocery.

A humorous writer has well said: "Any man can get out of a horn at one end or the other; the big end if he can, the little end if he must; but don't get stuck in the middle, it don't pay." To profit by the suggestions that we make is, to get out at the big end.

"It will cost something," so it will, but cutting prices below the cost of production will cost more. And it is not enterprising to do it. It shows a want of tact to seize hold of the forces, and find a way out or make it.

WANTS TO KNOW ABOUT CLAYS.

A new man in the tile business wants to know all about the different kinds of clay, and his desire for information does him credit. It is far better to say "I want to learn all I can about the clay-working business" than it is to think that the process is so simple that a fool might know all about it. The question, however, is a very broad one, as experienced clayworkers will at once concede. To give a more definite idea as to its breadth, we will make the statement that there is probably not a practical clay man in the land that will claim that he knows how to work all kinds of clay, or who would venture to say that he could outline every characteristic in a clay that he had never worked. It is an untried field, and those who have had the most experience are most careful, not to tread carelessly on unfrequented ground.

Oh, yes; there are indications that may serve to help on to a knowledge of the characteristics likely to be developed. For example, the clay may be plastic,

free from stone or lime pebbles, be adhesive, and so on, and the experienced clayworker will probably say, "It will likely make a good tile or brick." But an actual test is the only safe guide.

Clays may look very much alike, so much alike that they cannot be distinguished apart at sight, and then develop quite different results.

Again, a particular clay will burn hard at a much lower temperature and in less time than another clay, though the two clays may look and handle alike.

The most experienced in the clay business, would, in all probability, be the most cautious in working and burning the first kilns of an untried clay. No one can certainly tell, what any clay will develop, until tested. A chemical quantitative analysis will indicate the probabilities to those who have compared the analyses with the characteristics actually developed in working various kinds of clay, but this is all. There is nothing certain until the clay is known by actual test, with certain conditions.

But, notwithstanding the intricacies of the clay business, there are many practical lessons to be learned from the experience of others. By reading the experience of those who are willing to impart information through the publications devoted to their interests, also by attending the meetings of those engaged in the same kind of business, not only in the papers read and in the discussions had, but a vast deal of information is to be had by setting down and talking face to face with those that have had experience, which can be done at the hotels and stopping places on such occasions.

The clay field is a broad one and the experience varied, so much the more, is there a need of seeking information through any and all channels.

SITTING ON A TILE.

"It beats all," how particular some men can be. There is old 'Squire Pinchcraft, he just looked through every tile that went into his load and set out every one that had a wart on it, inside or out. I let him do it and then ricked them up with the others. They are as good as any tile in the rick. But the squeezing time came when old 'Squire paid for them. He counted his money over and over again, and it was like pulling an eye tooth, to get it out of his weasel skin, the last piece of change to make the right amount. * He kind of cleared up his voice and said:

"You ought to sell them lower to me for the cash down."

I replied:

"I do. They are 5 per cent. off, and to think of the kind of tile you got."

He chuckled to himself and said:

"I want the best," and drove on—looking back, he said, "I've got to get a lot more yet."

He is pleased and so am I. It was a good deal better to let him set a few rough tile out than to wrangle with him. If the tile are nixed next time he would take half of those he set out.

But there is Jim Frye a coming, he wants tile. When do you suppose I will get pay for what he gets? Not before the birds go south next fall—a whole year. I know him. I will put on 10 per cent. for the time, and he will take anything I hand him (culls and all). So it goes—one hand washes the other.

"Up the creek Tom Barber" was here yesterday morning, nosing 'round for prices, but I knew his trick and wrote nothing down for some other factory to duplicate at a less price, but told him when he got through looking, to come 'round and I would sell him what tile he wanted.

Now, he will spend a week to save a dollar, and, like as not, get beat.

But, come here, I want to show you something. Last fall—this fall a year ago—I had a lot of clay spaded up to weather over winter, and here are the tile that I made from that clay. See the difference? These are solid, ring clear as a bell, and those made from the clay dug this summer are a little off, you will see by examining them.

I have got to get a new machine, one that will make larger tile. I could have sold a lot of big tile this season if I had had them. The largest I can make is 10-inch, and I could have sold three thousand 16-inch tile for the Paddy creek ditch. Next year they are talking of putting the Duck branch underground as far down as the Red school-house. The demand for large tile will be lively for years to come. All the open ditches will be put under ground. It makes the land so much more convenient to cultivate, and gets rid of the weeds and bushes and briars that will grow along the open ditches.

I am going to be ready for the wagon, mind you."

Drainage & Tile Notes.

Hindsboro Tile Works closed for the season.

The Tile Factory at Mahomet, Ill., has closed for the winter.

Galesburg (Ill.) Brick and Tile Works have shut down for repairs.

E. B. Lutes, Loda, Ill., expects to run his factory during the winter.

Butler's Tile Works, Stony City, Ill., has closed down for the winter.

The Spencer Brick, Tile and Terra Cotta Company have on hand a large

supply of building brick, paving brick and tile in all sizes.

The Erlin Tile Factory at Clyde, O., reports a good season's business.

Woodford Tile Factory, Woodford, Ill., is reported as doing a good business.

A brick and tile factory for Bradford, Pa., has been chartered. Capital \$20,000.

Lake City, Ia., has a new brick and tile plant launched into success—in full operation.

Zerry Lewellen, has purchased his partner's interest in the tile factory at Decatur, Ind.

The Brunswick Brick and Tile Co. has been organized at Brunswick, Mo. Capital \$20,000.

The letting of a contract for a public ditch is advertised for December 8th, at Albion, Noble Co., Ind.

David Naylor's Tile Works at Fisher, Ill., 22 kilns of good brick and tile have been burned this season.

The Greenford (O.) Tile Works has been enlarged to supply the growing demand for their products.

The tile factory at Earlville, Ill., will be run next year by Kleffman Bros. E. Dewey has rented his half to Jno. Kleffman.

Mr. George J. Walter, at Champaign, Ill., has been packing the walls of his dry house with sawdust, and has put in a new tile mill.

The Cuba (Ill.) Tile Works have shut down. The men refuse to work longer without pay. The works are said to be owned by two Chicago board of trade men.

H. C. Patton, Flanagan, Ill., has increased the capacity of his brick and tile works by putting in a larger machine, purchased of the Adrian Machine Company.

A very large amount of tile draining has been done in the vicinity of Milington, Ill., this season. An exchange says that "Farmers are each year becoming more fully alive to the benefits of tile drainage." It is also a fact, (so they say,) that snow melts away sooner

on drained than undrained land, hence the drained soils are ready for the plow sooner. In Scotland, it is claimed that the harvest is ten days earlier on drained than undrained land.

The brick and tile company at Middleville, Mich., have shut down for the winter. During the Summer's run they turned out about 2,000,000 brick and 150,000 tile.

Articles of incorporation of the Iowa Ditch Co. have been filed. Capital stock \$24,000. The company will dig a ditch in Fresno Co., starting at Fowler switch canal.

The brick and tile company at Gonzales, Tex., are working twenty to thirty lands, and have placed new machinery in the plant and are turning out a handsome product.

Robert Unzicker, proprietor of the brick and tile works, Peru, Ill., is reported as having had a good trade this season. It is due him to say that he understands the business well.

Lynch & McMichael's tile factory at Ransom, Ill. was totally destroyed by fire early Monday morning. The loss is \$8,000, with no insurance. The factory employed 25 men, who will be out of work for the winter, as the owners will not rebuild until spring. The fire was incendiary.

Articles for the incorporation of a new company for making brick and tile, Logan, O., were filed with the Secretary of State last Thursday by a number of our citizens. The capital stock is \$25,000. The incorporators are John Hansen, D. W. Wright, James Dicken, B. H. Allen, Robert Wright, Jr. and Joseph M. Payne.

North Baltimore, O., has a new tile plant which is said to be the largest in the state. A number of Findlay gentlemen are interested in it. Mr. D. E. Child is president. Henry Barber, secretary and treasurer, John P. Murray, vice president, and J. N. Woolfington a member of the board of directors. The building is four stories in height and there is twenty-four thousand square feet of drying floor, including the basement.

SAMUEL C. COWGILL

Drain Tile Manufacturer, Summitville,
Indiana.

Mr. Samuel C. Cowgill is a native of Ohio, was born in Highland County in 1840, where he commenced the manufacture of drain tile in 1871. Soon after he removed to Cadiz, Henry Co., Ind., where he continued the business to 1880, when he removed to his present location. In beginning the business at the latter point, his plant was a small affair compared with the present outfit.

Mr. Cowgill is a man of indomitable will power, and has the push to overcome obstacles that would wholly discourage many men. Having enlarged his works after two or three years, to the point of doing a large business, he had the misfortune to have them go up in smoke and ashes without having any insurance. In a short time he erected a larger plant than before, and, in many respects, one of the best plants in the State. Extending his trade, he was doing an immense business, when his whole plant excepting kilns were again burned (no insurance). He rebuilt (in an incredible short time) as large and better than before.

He has the advantages (and disadvantages) of natural gas. The tile are dried and burned with natural gas.

The same energy has characterized his efforts in extending his trade. He probably makes more large drain tile than any two factories in the State, so that he

has both a large shipping and local trade. As a means of extending his trade, by increasing the interest in tile drainage, Mr. Cowgill, in the beginning of the year 1882, advertised that on the 14th day of November of that year he would award the following premiums on samples of corn grown on tile drained land. Best bushel, \$25 (in tile); Second Best, \$15; Third, \$10.

On the day appointed, having been invited to be present and address the meeting, we appeared in person to see the show. To our astonishment there

were forty-two exhibits. No State Fair that we have ever attended has had such a display of fine corn.

Mr. Cowgill is not only devoted to his business as a manufacturer of drain tile, but he finds time to look after the moral, social and educational interests of his family and neighborhood. An active business life is not allowed on his part, to wholly absorb his higher and better



SAMUEL C. COWGILL.

manhood. Mr. Cowgill has been a regular attendant at the meetings of the State tile conventions and quite ready to impart any information growing out of his experience, when so requested. His advance position in his business has led many to visit his works to witness the working of his machinery and learn of his methods. To all who come he is ready and free to talk and give them the fullest information at his command.

Bentonville, Ark., are agitating the question of building a tile factory.

C. & A. POTTS & CO.

The above firm was organized in December, 1885, consisting of Clayton Potts, Albert Potts, and Lindley Vinton. Clayton and Albert Potts are sons of George Potts, of Indianapolis, Ind. The father is an experienced machinist. The sons were practically reared in a machine shop, excepting the time necessarily required to attend the schools and higher institutions of learning. After some two years' experience in conducting a general machine shop they established their present works. The beginning was small compared with their present facilities.

The first machine or device that attracted the general attention of the clayworking craft was their Disintegrator, a machine that cuts and separates clay into small particles, so thoroughly and so rapidly as to meet the wants of either small or large operators. After years of severe tests they are unrivaled for the use intended.

In the year 1888 they devised and

built the well-known Horizontal Stock Brick Machine, the merits of which have been so thoroughly tested that there is no need of particularizing the advantages of this machine.

They also manufacture Pug Mills, Mold Sanders, Winding Drums, Clay Cars, Mold Trucks, Barrows, Brick Molds, Etc. In short, a full line of sup-

plies for brickyards.

From the time of locating their works until the present they have continued to add to their buildings and facilities in the way of tools and appliances until they have in operation some of the most valuable and costly tools in use. This growth of facilities have resulted from the growth of their trade.

They have enlarged because the rapid growth of their trade demanded it.

They are young men with large experience both as machine manufacturers and in practical clayworking in the line of their machinery. They have gone out into the field and studied the needs and improved and devised machinery to meet the wants of those



CLAYTON POTTS.

engaged in the manufacture of brick and other clay goods. And it is to be said, to their credit, that few men of their age have compassed so wide a field in the business.

They have the facilities for conducting a large business, and are painstaking as to the character of their work done, both as to its efficiency and durability.

Before them there is prospectively many years of active life and a wide field for the employment of their energies.

The developments in the clay-working field in the past ten years has resulted in the invention of many useful devices in clayworking machinery, some of which are marvelous for their ingenuity, efficiency and capacity. Foremost among those entitled to special mention in this line is the firm of C. & A. Potts & Co.

The managers of the Chicago Exposition have decided to receive nothing but half dollars for admission to the fair, for the reason that tickets are easily counterfeited.

HE SAW IT IN A DIFFERENT LIGHT.

Mr. Brown—Good morning, neighbor. I am making the rounds of a few neighbors this morning, to see if I can get a club of subscribers for the *Dairyman*. We are all more or less interested in butter making.

Mr. Price—I have been getting the

Farmer for two years and a half that is, I paid for one year and they have sent it a year and a half, since the time I paid for it was out, and if they keep on sending it, I won't need to subscribe for another.

Mr. Brown—But you will have to pay for it, and—

Mr. Price—No, I won't; if they don't stop it, you don't catch

me paying for it,—not me.

Mr. Brown—Why, neighbor, you have been taking it out of the post-office and reading it, and getting the benefit of it. You won't take the advantage of the publishers, will you?

Mr. Price—Well, I don't intend to pay for it.

Mr. Brown—You had better think the



ALBERT POTTS.

matter over a little. You intend to be an honest man, and you have not thought right over the matter. The post-office department have made it so easy to notify publishers of papers when subscribers don't want them, that there is no excuse for receiving and not paying for them, after your time is out. You tell the postmaster to notify the publisher that you don't want the paper any longer and he sends notice to the publisher, and there it ends, unless you are behind, then he may continue to send the paper until payment is made. I am behind on the *Dairyman* almost a year, but I have taken it from the office and read it. I would not think of taking it from the office if I did not intend to pay for it. I should think I was doing a wrong thing, and I think you will see it in that light when you think it over. One reason why I am trying to make up a club for the *Dairyman* is to make amends somewhat for neglecting to send the money sooner.

Mr. Price—I did not know that I could stop its coming so easy.

Mr. Brown—Yes, indeed, besides, if you take the paper from the office, you are legally bound to pay for the time you take it out, and you are honestly bound to pay for it, and, I have known you too long to believe that you would willingly do a dishonest thing.

Mr. Price—No; I want to do what is right. I confess that I have not looked at it in the light you have, but I expect you are right. Let me see; I would owe about \$1.50 now. If you are going to the post-office, I will give you the money, and let you send it, and I will take the *Dairyman* for a year.

Mr. Brown—I am glad to hear you say so, not because you think of going into my club, but for the better opinion that I will have of you as an honest

man. In my case I have neglected to pay, because I have allowed the matter to drift along, thinking it would be more convenient in the future. But I said to myself, yesterday, that I would attend to this little matter to-day, without fail, and save the publisher the expense of sending me a statement every three months. And I know that I will enjoy reading my paper better, for then it will not longer be a reminder of my neglect.

Mr. Price—I feel much the same about the — Farmer, but I thought myself excusable, on the grounds of their sending it without my further order.

Mr. Brown—Oh, as to that, I am glad the publisher of the *Dairyman* continued to send it and wait for the pay.

TRUTH.

A BIG JAR.

Joe Young, of Colchester, Ill., has been trying his hand on big jars. Quite recently he drew a jar from the kiln that holds fifty-two and a half gallons by actual measurement. There is quite a demand for the jar to salt pork in.

A BIG DEAL.

Col. Bogardus, of Paxton, Ill., has purchased 1,800 acres of swamp land from Hon. Chas. Dunham and Col. H. V. Fisher, of Genesee, Ill. Col. Bogardus makes it a business to buy up such tracts of land and drain them for agricultural purposes.

It is a right profitable business to buy such tracts at a low price per acre and then drain them at a cost of from five to ten dollars per acre, and sell them at thirty or forty dollars per acre, is it not?

The late statistics show that California has over one million orange trees bearing fruit.

Entered at the Postoffice at Indianapolis, Indiana,
as Second-class Mail Matter.

Preserve your papers and keep your files complete; you will have use for many things published and the volume complete will make a valuable book

*J. J. W. BILLINGSLEY, Publisher,
81 Massachusetts Ave., Indianapolis, Ind.*

The Drainage Journal (monthly, one year (in advance).....	\$1 00
Six copies (Club Rates).....	5 00
Ten " " ".....	8 00
Single Copies.....	10

Send for rates for larger clubs.

The Drainage Journal is the best and only publication in the world, especially devoted to the interests of tile manufacturers and those who use tile.

It has the largest circulation in the states of Indiana, Ohio, Michigan, Illinois and Iowa, and is taken by many subscribers in most all of the other states and in Canada, England and the Island of New Zealand.

It is taken by many brick manufacturers. It is the best possible medium for those having tile machinery, brick machinery, kilns, fire brick, engines, ditchers, clays, tile yards or second-hand machines for sale, to advertise in.

The rates of advertising are reasonable.

ADVERTISING RATES:

Per line, each insertion.....	\$ 25
Per inch, each insertion.....	1 50

No advertisement inserted for a less sum than \$1.
Twelve lines Nonpareil type make one inch.

Twelve lines Nonpareil type make one inch.
Liberal discount for longer time and larger space.
Transient advertisements must be paid for in

Transient advertisements must be paid for in advance.
For large advertisements address the publisher for terms.

The proceedings of the Indiana Tile, Brick and Drainage Association will be published in the January number of the JOURNAL.

In the January number of the JOURNAL there will be an article on drying drain tile or brick with steam. A system of pipes for the use of exhaust or live steam will be illustrated.

Those remitting us the amount of their subscription to the DRAINAGE JOURNAL, including the year 1892, before the first of January next, we will mail them free, on request, a *Tile Cut*, suitable for advertising in local papers.

The above caption is a very common expression, but there is so much in seeing a thing that we wish to call attention to it, by giving the following brief extract from an editorial in the *Homestead* as an introduction to our subject:

“It is the man who sees things, who ‘in old time was called the seer,’ that succeeds. In the workshop it is the man who sees how the same object can be accomplished by a new device, or by a dexterous use or modification of an old, that wins his way to the front. How often in past years as we have looked on some new device have we not wondered where our eyes were that we did not see it. ‘So simple!’ Yes, but why did we not see it? Simply because we did not look; at any rate look with sufficient intentness to see. The man who did see won the premium which had been hung up before all eyes since the world began. In the school room it is the man who sees clearly himself that is able to teach others and make them see. ‘Do you see it now?’ is the expression used on ever hand in the sense of ‘do you comprehend it?’ It is the boy or girl with insight, that sees things, that forges to the front. We believe that the best reason possible to be given for the failure of many men to win success might be expressed in the brief phrase, ‘having eyes they see not.’ * * * * *

"It is the man who looks, who sees, and, when a boy, is taught to look and to look intently and continually and with the determination to see, who will sooner or later take the premiums that are always held up in the greatest world's fair."

Seeing, so as to think and think practically. Men build tile factories, the

plans of which could be greatly improved by a little practical thinking. To illustrate, the following experience is in point: The writer, in company with a gentleman who had been in the business of making tile for eight or ten years, were visiting a large tile works. Walking into the building together, the first thing we saw was a wide belt running along on the top of a table two feet wide and a hundred feet long, the belt carrying the tile from the tile machine to any point along the table where they were wanted; the tile being taken from the belt and set on slats in the stalls. Four men were taking the tile from the belt and setting them to dry. And they had to jump around lively to keep the tile from passing by. There was a walk way on each side of the table between it and the stalls, of four feet, to accomodate the wheeling barrows in removing dry tile, and the stalls were eight feet deep. So that in beginning to fill the stalls the off-bearers were required to walk at least ten feet back and forth in delivering the tile. The gentleman who was with us said: "That is something new; I like it; I must have one in my factory. What do you think of it?"

We replied: "We don't like it." He was astonished at our (stupidity) reply and asked:

"Why not?"

"It requires too many steps and consequently too many men."

The proprietor came along soon, and we inquired how he liked it.

His brief reply was, "I don't like it. It takes too much "walkee." I intend to take it out and use barrows."

My friend that was with me never mentioned the carrying table while in my company. He did not think it all through, and did not see the disadvantages of the device.

In the construction of tile works there is much in so arranging everything so as to save steps, and especially if the extra steps are to be made a thousand times in a day. The same rule holds good in the construction of a house to live in. In making the plan, think how extra steps can be saved.

A poorly planned tile works may require much time or too much "walkee" to pay. Shorten every step possible; it is so much money in the pocket of the proprietor. It takes time to make the extra steps, and "time is money," as Poor Richard says.

It is the want of seeing that prevents some men from building up their business. They are blindly waiting for business to come to them, and it don't come and they can't see why, but seeing eyes find or make a way to success.

Send remittances of subscription in this month for the ensuing year.

THE INDIANA CONVENTION.

The Indiana Tile, Brick and Drainage Association will meet in the Agricultural Rooms of the State House, December 8 and 9. We have not received replies from all the parties written to for papers, but the subjects, published in the November issue of the JOURNAL, together with other practical questions, will be discussed during the session of the convention. Mr. W. A. Eudaly, of Cincinnati, will read a paper, in addition to what has heretofore been published. We have also some special promises for papers.

It is intended that the sessions of the convention shall be devoted to the discussion of questions of the most practical utility to those in attendance, in the exchange of experience of "how and why to do." We have not been able to secure of the railroads special rates,

on account of the burden imposed upon us by the Central Traffic Association. They require us to guarantee a large number to be in attendance, and pay \$23 to defray the expense of a special agent to be in attendance at the sessions of the convention to see if there is the requisite number of members, and if there are not a sufficient number in attendance no return tickets at one-third fare will be sold and the Association is out the money paid for the special agent. The committee declined to advance the money upon the conditions named, for the reasons that they are not so authorized by the Association, and for the further reason, they regard the demand as unjust. We are informed however, that many, if not all, of the State Associations are in the same boat.

We hope, however, that no one expecting to attend will fail because of having to pay regular fare on the railroads. The usual discount in hotel accommodations can be had.

In another column will be found a communication from the secretary of the Association, who urges a large attendance for important reasons, which should be well considered. Besides, there is much to be gained in coming together and exchanging experiences and gathering information of practical value.

A WORD OF COMMENDATION.

We seldom publish anything in the way of favorable representations, as our readers well know but the following unsolicited words of praise are selected from many for their brevity:

"We are well pleased with the DRAIN-AGE JOURNAL for its information and consider it one of the best advertising mediums for tile and brickmakers supplies.

"The success I have had in the sale of my improved kiln advertised in its col-

umns, is the best proof of the fact to me. Wishing you continued success,
Yours very respectfully,
Nov. 28, '91. J. B. CRAWCOCK.

Miscellaneous.

The Grumbler.

HIS YOUTH.

His coat was too thick and his cap was too thin:
He couldn't be quiet, he hated a din;
He hated to write, and he hated to read;
He hated to cipher in every deed.
He must study and work over books he detested;
His parents were strict, and he never was rested.
He knew he was wretched as wretched could be,
There was no one so wretchedly wretched as he.

HIS MATURITY.

His farm was too small, and his taxes too big;
He was selfish and lazy and cross as a pig.
His wife was too silly, his children too rude.
And just because he was uncommonly good.
He never had money enough or too spare;
He had nothing at all fit to eat or to wear.
He knew he was wretched as wretched could be.
There was no one so wretchedly wretched as he.

HIS OLD AGE.

He finds he has sorrows more deep than his fears;
He grumbles to think he has grumbled for years;
He grumbles to think he has grumbled away
His home and his fortune, his life's little day;
But, alas! 'tis too late, it is no use to say
That eyes are too dim, that his hair is too gray.
He knows he is wretched as wretched can be;
There is no one more wretchedly wretched than he.

—Farmer's Advocate.

TO CURE OBESITY.

In a French journal is announced the discovery of a means as simple as it is strange for curing obesity. This discovery is attributed to a medical officer in the army. Thanks to him an army officer who was threatened with retirement from the army, as he was so heavy that it required two men to lift him to the saddle, became thin in a few weeks. He was so thin that he had to take means to recover in a measure what he had lost. It was to his doctor he was indebted for becoming a general.

The means consisted simply in never eating more than one dish at each meal, no matter what that dish may be. A person may consume as much as the stomach can bear and satisfy the appetite without the least reserve. Nevertheless, nothing but the one dish should be taken. No condiments, no soups, no supplementary desserts should be allowed. This system was also recommended by the author to a lady, with similar results. The lady suffered no inconvenience whatever from this diet.

It is said that both the officer and the lady found by their experience that the partaking of only one dish, whether it be meat, fish or vegetable, brought on a sense of satiety much sooner than if a variety of dishes had been taken.—*Manly Tempest, M. D., in New York Commercial Advertiser.*

THE APPLE EPICURE.

I have come to understand why I like apple lovers. They are usually—perhaps because of the apples—people with healthy livers; and people with healthy livers are sure to be amiable. They are people with good, strong, white teeth; for your apple-lover does not like his apple as he must eat it at desert—peeled and delicately sliced with a silver knife.

He desires to partake of the fruit that tempted Eve as it grows, biting it through the skin and eating it down to the core, and not weary of it as he flings that away, and the jaws of those who love apples are the jaws of those who chew well, and this makes them pleasant to look upon. A sot never likes apples. The man whose dinners are in many courses, and who gloats over the green fat of turtle soup, and is full of deep knowledge of liqueurs and the brands of champagne, cares little for apples. The eater of good and simple food is the apple lover; the man, whatever his age, is young at heart. The apple epicure is not a glutton; he never gives himself remorse and a doctor's bill with apples. It is his joy to break his apple and share it with his dearest friend. He is capable of taking it entire to his best beloved, but it needs an ardent passion for such a sacrifice. I cannot imagine a very wicked woman eating apples in this epicurean fashion. She might be fond of oranges, or of white grapes, or anything expensive in the way of fruit, but the simple Yankee apple, blushing from the tree, in which the farmer's rosy daughter takes delight, assuredly she despises.—*New York Ledger.*

VARIOUS USES FOR AMMONIA.

A little ammonia in tepid water will soften and cleanse the skin.

Spirits of ammonia inhaled will often relieve a severe headache.

Doorplates should be cleaned by rubbing with a cloth wet in ammonia and water.

If the color has been taken out of silks by fruit stains, ammonia will usually restore the color.

To brighten carpets wipe them with warm water in which has been poured a few drops of ammonia.

One or two tablespoonfuls of ammonia

added to a pail of water will clean windows better than soap.

A few drops in a cupful of warm water applied carefully will remove spots from paintings and chromos.

Grease spots may be taken out with weak ammonia in water; lay soft white paper over and iron with a hot iron.

One tablespoonful of ammonia to a teacupful of water will clean gold or silver jewelry; a few drops of clear aqua ammonia poured on the underside of diamonds, will clean them immediately, making them very brilliant.—*Con't. F'm'r.*

Anarchists are chiefly natives of Russia.

PUBLICATIONS.

AGRICULTURAL REVIEW, Vol. 1, No. 2, Egg Harbor City, N. J., 50 cents a year, is laid on our table. An interesting number.

LIGHT ON A DARK SUBJECT, a unique catalogue of Clayworking Machinery manufactured by C. & A. Potts & Co., of this city. Will be mailed to those who apply.

IRRIGATION AGE, received just as we go to press, the September number, Vol. 1, No. 10, semi-monthly, \$2 a year, published at Salt Lake City, Utah. Looks well—we could probable stand a later issue. The field is wide and important.

NEW ADVERTISEMENTS.

J. W. Penfield & Son, Willoughby, O.
C. & A. Potts & Co., Indianapolis, Ind.
E. M. Freese & Co., Galion, O.
W. L. Rich, Jonesboro, Ind.
Wm. Stahl, Quincy, Ill.
George H. Stahl, Quincy, Ill.
For Sale, Etc.

The Jeffrey Manufacturing Co., of Columbus, O., has opened branch houses at 15 Cortland St., New York. Mr. F. C. Ayers in charge; also at 48 S. Canal

St., Chicago, Ill. The demand for their goods have necessitated this arrangement to better accommodate their trade.

REPORTS OF VIEWERS ON DITCHES.

In Fulton County, Ind.

Union Township Ditch.

Russell Ditch, and Tholman Ditch, December 10.

The Jones Ditch for the counties of Fulton and Pulaski, December 11.

Aaron D. Hizer Ditch (in Fulton Co., Ind.) December 11, 1891.

MEETING OF TILE AND BRICK CONVENTIONS.

Indiana—Indianapolis, December 8 and 9, 1891. J. A. Dailey, Secretary, Riley, Ind.

Illinois—Springfield, January 19 and 20, 1892. G. C. Stoll, Secretary, Lexington, Ill.

Iowa—Des Moines, February 3 and 4, 1892. C. L. Smith, Secretary, North English, Ia.

Ohio—Columbus, February 9 and 10, 1892. W. D. Richardson, Secretary, North Baltimore, O.

A CALL TO COME

To Tile and Brick Manufacturers and All Those Interested in the Use of Tile.

We are going to have our annual convention at Indianapolis December the 8th and 9th, to be held in the rooms of the State Board of Agriculture in the State House.

It is our desire to meet every tile and brick manufacturer and those interested in farm drainage, in this and adjoining States, that can, attend. Let everyone come with something to say, so that we may have a rousing meeting—a meeting like those of years gone by. The past season has been a prosperous one for the farmers

in most part, which promises a coming prosperity in our business. So let us prepare to meet it. Do not stay at home as some have done in the past, to keep the little they have and learn no more. But let us all take a little outing toward the capital on the morning of December the 8th, and have a little recreation from our daily routine of business.

And, as a great many tilemakers have turned their attention toward other clay industries, especially brick, we will try and make it as interesting for the brickmakers as for the tilemaker.

Let every tilemaker invite his neighbor brickmaker to come with him.

There is an inspiration in meeting and talking with those of like callings in convention and around the hotels, that will cause all to go home pleased, because we have attended the convention. And for aught we know we may get some practical suggestions that will enable us to make some changes in your work that will stop a large leak in our expense account that will be worth many times the expense of attending the convention.

Let me further urge every tilemaker in the State to attend, for it is well-known that we are in need of some important legislation, and now is the time to arrange to secure it so as to get it before the legislature of 1893. It will be greatly to our interest to get the needed legislation, and a large, well attended convention will have much to do in securing it. J. A. DAILEY,

Sec'y Ind. T. B. & D. Ass'n.

Riley, Ind., Nov. 18, 1891.

IF YOU HAVE ANYTHING TO SELL

In the way of second-hand tile machinery advertise it in the "For Sale" column of this Journal.

A TILE FACTORY.

If you have a desirable tile factory that you would like to sell, for good reasons, advertise it in this Journal.

A GOOD LOCATION.

If you have a good location and a desirable clay for a tile factory, and wish to secure the location of a factory for the benefit of yourself and the community in which you live, advertise the fact in the "Wanted & For Sale" columns of this Journal.

One or two dollars expended in this way may find a purchaser or place that will be worth many times the cost.

Advertisements to be sure of insertion in the next issue must reach us by the 20th of the month.

See terms at the head of the "For Sale & Wanted" column.

This is the time of year for changes and purchases of machinery. For making contracts for help, etc., and now is the time to advertise.

The Jeffrey Mfg. Co., of Columbus, O., report business as good in their different specialties. They have many large orders on their books for elevators and conveyors, for handling material in bulk or package; and have recently purchased a tract of land adjoining their present works, on which they have erected a large and substantial brick building, that they may be better able to take care of their growing business."



SPRAY YOUR FRUIT TREES AND VINES

Wormy Fruit and Leaf Blight of Apples, Pears, Cherries, Grape and Potato Rot, Plum Curculia prevented by using **EXCELSIOR SPRAYING OUTFITS.** PERFECT FRUIT ALWAYS SELLS AT GOOD PRICES. Catalogue showing all injurious insects to Fruits mailed free. Large stock of Fruit Trees, Vines, and Berry Plants at Bottom Prices. Address WM. STAHL, Quincy, Ills.

Wants & For Sale.

Advertising Rates.

Advertising rates in this column 25 cents per line for each insertion, and no advertisement inserted for less than \$1.00, however small.

FOR SALE CHEAP.

Stevenson Dry Pan. Good order New. Address us. LITCHFIELD BRICK & TILE WORKS, Litchfield, Ill. 3 t.

FOR SALE.

Drain tile, all sizes from 3 to 24-inch. Special shipping rates. S. C. COWGILL, Summitville, Ind.

FOR SALE.

1 Ohio Tile Machine, size D.
1 Penfield No. 6.
1 Clay Crusher.
Address J. D. FATE, Plymouth, Ohio. 11.

FOR SALE CHEAP.

One Upright Engine 14x14, 50 H. P., Judson Governor, run but little; has been thoroughly overhauled and put in order. Address, MICHIGAN BRICK & TILE MACHINE CO., Morenci, Mich.

FOR SALE OR TRADE.

One of the best steam power tile factories in the gas belt. Located by R. R. Switch. Plenty of natural gas. Runs all winter. Everything in good running order. Will sell half or all the plant. JOHN W. RUST, Herbst, Grant Co., Ind. 3t.

FOR SALE.

Having decided to quit the tile business, I offer my half interest in the tile factory situated at Mazon, Ills., for sale or trade for real estate. Business good and machinery and kilns in good order. For particulars, call on or address B. W. COCHRAN, Mazon, Ills., Box 50.

FOR SALE.

New Leader Brick and Tile Machine, dies 3-inch to 15-inch inclusive and lubricating brick die, tables and fixtures, complete. Adrian Brick and Tile Machine, almost new, dies 3-inch to 12-inch and brick die, complete. Also one second-hand Leader, dies 3-inch to 10-inch, complete. And one 30 h. p. Engine and Boiler. Will sell to reliable purchaser on approval. Write for prices to GEO. A. HARROP, Rock Island, Ill. 12. 11.

FOR SALE.

A saw mill—a merchant mill with top saw—two saws, one 58 inches and one 60 inches—the latter nearly new. A set of Atkins' Duplex patent Dogs, Cut-off Saw, Edging Table and Saws, also Lath saw and Table. It is a first-class mill in every respect except power. Timber can be bought at fair figures. This mill will be sold at a bargain. Address, M. J. LEE, Crawfordsville, Ind. 12. 11.

CINCINNATI SEWER PIPE COMPANY.

(Successors to J. V. Nicolai.)

P. H. STRAUS, Manager.

Besides making Vitrified Stone Sewer Pipe we Manufacture and keep in stock a full line of

FIRE BRICK

FOR

Kiln Building & Boiler Setting.

Also Headquarters For

Cement, Lime, Plaster, Stoneware, Etc.

Office and Factory, Cor. Elm & Water Sts.,

Cincinnati, O.

THE NEW WEBSTER JUST PUBLISHED—ENTIRELY NEW.



WEBSTER'S INTERNATIONAL DICTIONARY

A GRAND INVESTMENT

for the Family, the School, or the Library. Revision has been in progress for over 10 Years. More than 100 editorial laborers employed. \$300,000 expended before first copy was printed. Critical examination invited. Get the Best. Sold by all Booksellers. Illustrated pamphlet free. G. & C. MERRIAM & CO., Publishers, Springfield, Mass., U. S. A.

Caution:—There have recently been issued several cheap reprints of the 1847 edition of Webster's Unabridged Dictionary, an edition long since superannuated. These books are given various names,—"Webster's Unabridged," "The Great Webster's Dictionary," "Webster's Big Dictionary," "Webster's Encyclopedic Dictionary," etc., etc.

Many announcements concerning them are very misleading, as the body of each, from A to Z, is 44 years old, and printed from cheap plates made by photographing the old pages.

MONEY IN CABBAGE AND CELERY.

"Blood will tell." Good crops can not be grown with poor strains of seed.

For sixteen years Tillinghast's Puget Sound Cabbage Cauliflower and Celery Seeds have been gaining in popularity. The most extensive growers all over the Union now consider them the best in the world. A catalogue giving full particulars regarding them will be sent free to any one interested. When writing for it enclose 20 cents in silver or postage stamps and we will also send "How to GROW CABBAGE AND CELERY," a book worth its weight in gold to any grower who has never read it. Address

ISAAC F. TILLINGHAST,
La Plume, Pa.

4 t.

Hatch Chickens by Steam. IMPROVED EXCELSIOR INCUBATOR



Will do it. Thousands in successful operation. Simple, Perfect and Self-Regulating. Lowest-priced first-class Hatcher made. Guaranteed to hatch a larger percentage of fertile eggs at less cost than any other. Send 6c. for illus. Catalog. GEO. H. STAHL, Quincy, Ill.

The Drainage Journal Job Office,

PRINTERS OF

BRICK AND TILE MAKERS' SUPPLIES OF EVERY DESCRIPTION.

Letter Heads, Bill Heads, Envelopes, Cards and Circulars executed neatly and promptly.

SPECIAL ATTENTION GIVEN TO CATALOGUES AND PAMPHLETS.



RAYMOND'S PERFECTION BRICK PRESS.



For repressing Red or Fire Brick, making Ornamental Designs, Paving Tile, etc.

BRICK MAKERS' SUPPLIES.

Tempering Wheels, Trucks, Moulds, Barrows, etc.
Send for circulars.

C. W. RAYMOND & CO.,
DAYTON, OHIO.



The Pullman Car Line
Between

INDIANAPOLIS AND
CINCINNATI.

The Favorite Line with
Through Dining Car

CHICAGO AND CINCINNATI,

ST. LOUIS AND CINCINNATI.

Best Line to

CINCINNATI, DAYTON, LIMA, TOLEDO, DETROIT AND CANADA.

Through Cars between Decatur, Springfield, Quincy, Keokuk and Cincinnati.

Pullman Sleepers on night and Palace Parlor Cars on day trains.

Direct connection without transfer in Cincinnati for points in Kentucky, Tennessee, Alabama, Florida and the South.

Washington, Philadelphia, New York and the East.

Ask for tickets and see that they read "Via C. H. & D." on sale everywhere.

H. J. RHEIN, Gen'l Agent, Indianapolis, Ind.	C. H. ADAM, City Ticket Agent, Indianapolis, Ind.
M. D. WOODFORD, Pres. and Gen'l Mgr. Cincinnati, O.	E. O. MCCORMICK, G. P. and T. A. Cincinnati, O.



Short Line to Kansas City and the West.

Lv Indianapolis	8.30 am.	11.22 pm. (daily.)
Ar Decatur	2.45 pm.	3.55 am.
Springfield	4.45 pm.	6.00 am.
Jacksonville	6.15 pm.	7.12 am.
Hannibal	9.35 pm.	10.40 am.
Quincy	9.50 pm.	10.45 am.
Keokuk	11.15 pm.	11.35 am.
St Louis	6.45 pm.	7.45 am.
Peoria	6.45 pm.	9.15 am.
Kansas City	7.10 am.	6.15 pm.

The Tuscola Accommodation leaves Indianapolis daily, except Sunday, at 4.15 p.m. and arrives at Tuscola at 8.30 p.m. Leaves Tuscola at 6.00 a.m. and arrives at Indianapolis at 10.10 a.m.

The only line running reclining chair cars daily between Indianapolis and Keokuk, Ia., without change, running through Decatur, Springfield, Jacksonville, Chapin Bluffs, and Clayton, Ills. To Quincy, Ills., and Hannibal, Mo., without leaving the train.

City Ticket Office, 134 South Illinois Street, Indianapolis. J. G. HOLLENBECK, JNO. S. LAZARUS, City Ticket Agent. General Fr't and Tkt Agt.



LEAVE INDIANAPOLIS.

No. 2—Chicago Express, daily, except Sunday..... 7:30 a. m.
Arrive in Chicago 2:30 p. m.

No. 32—Chicago Limited, with Pullman Vestibuled coaches, parlor and dining car, daily..... 11:10 a. m.
Arrive in Chicago 5:00 p. m.

No. 34—Chicago Night Express, with Pullman Vestibuled coaches and sleeper, daily 1:15 a. m.
Arrive in Chicago 7:35 a. m.

No. 18—Monon accommodation, daily..... 6:00 p. m.
LEAVE CHICAGO.

No. 1—Indianapolis Express, daily, except Saturday..... 11:55 p. m.
Arrive in Indianapolis 8:35 a. m.

No. 31—Indianapolis & Cincinnati Limited, parlor and dining car, daily..... 9:55 a. m.
Arrive in Indianapolis 3:55 p. m.

No. 33—Indianapolis & Cincinnati Vestibuled Night Express, daily..... 9:30 p. m.
Arrive in Indianapolis 3:55 a. m.

Pullman Vestibuled Sleeper for Chicago stands at west end of Union Station, and can be taken at 8:30 p. m., daily.

Ticket office, No. 26 S. Illinois St.
I. D. BALDWIN, D. P. A., Indianapolis.
JAS. BARKER, G. P. A., Chicago.

**BIG
4
ROUTE**

The Shortest and most
Direct Route

**East, West,
North, South.**

Solid Vestibule Trains,

CONSISTING OF

The **FINEST COACHES, PARLOR, RECLINING CHAIR, CAFE and DINING CARS; WAGNER COMPARTMENT, BUFFET and STANDARD SLEEPING CARS.**

Heated with Steam and Lighted by Electricity,

FORMING

The FINEST TRAINS in AMERICA or THE WORLD.

Its SUPERB TRACK and UNRIVALED MACHINERY and EQUIPMENT permit the HIGHEST SPEED with PERFECT SAFETY.

It is the only line which lands its passengers at the GRAND CENTRAL DEPOT in the heart of the great city of NEW YORK, which is an advantage of NEARLY TWO HOURS IN TIME OVER OTHER ROUTES.

Its entrance into CHICAGO surpasses all others, passing through the famous CITY OF PULLMAN, along the LAKE FRONT, and the far-famed MICHIGAN AVENUE BOULEVARD, in full view of the finest RESIDENCES and PUBLIC BUILDINGS. In fact, its Connections and TERMINAL FACILITIES at all points are superior to those of any other line.

Its trains enter the Central Union Station, CINCINNATI; the Union Depots, CLEVELAND, BUFFALO and ALBANY; the Grand Central, NEW YORK; the Boston and Albany, BOSTON; the Union Depot, ST. LOUIS; the Union Depot, PEORIA; the Great Central Depot, CHICAGO; the Union Station, INDIANAPOLIS, and numerous others in the vast territory it traverses between the MISSISSIPPI RIVER on the west; the OHIO RIVER on the south; the GREAT LAKES on the north, and the principal SEA-BOARD CITIES in the east.

The Indianapolis Offices of this great line are located at

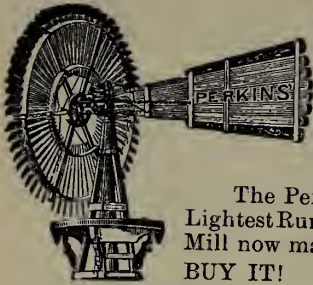
**No. 1 East Washington Street,
138 South Illinois Street,**

and the UNION STATION, where tickets can be procured to all parts of the UNITED STATES and CANADA and MEXICO, at the lowest current rates, and full information as to routes, conditions, connections, etc., etc.

OSCAR G. MURRAY, Traffic Manager. D. B. MARTIN, Gen'l Passenger Agt.

H. M. BRONSON, Ass't Gen'l Passenger Agent Indianapolis, Ind.

The Perkins Wind Mill.



NO DOUBT

BUT

A Fact

The Perkins is the
Lightest Running Wind
Mill now made.

BUY IT! TRY IT!

After 21 years of success in the manufacture of Wind Mills, we have lately made a complete change in our mill, all parts being built stronger and better proportioned and a self-lubricant bushing placed in all boxes to save the purchaser from climbing high towers to oil it. The same principles of self governing retained. Every part of the Mill fully WARRANTED and will run without making a noise.

The reputation gained by the Perkins Mill in the past has induced some unscrupulous persons to imitate the mill and even to take our NAME and apply it to an inferior mill. Be not deceived; none genuine unless stamped as below. We manufacture both Pumping and Geared Mills, Tanks, Pumps, etc., and General Wind Mill Supplies. Good Agents wanted. Send for catalogues and prices.

PERKINS WIND MILL AND AX CO.,

MISHAWAKA, INDIANA.

THE PEGOS VALLEY THE OF FRUIT BELT NEW MEXICO

Over 100 miles of irrigating canals now completed, each from 18 to 60 feet wide and carrying 5 to 7 feet of water.

Over 300,000 acres of the richest lands in the world already available for irrigation and farming under these canals, twenty-five per cent. of which are still subject to entry under the homestead laws.

Other lands for sale at \$15 to \$30 an acre and on easy terms.

The Pecos River being fed by never failing springs of immense size, the water supply for all the canals can carry is assured.

Climatic and soil conditions here are superior to those of Southern California. All the fruits grown there can be produced here, except oranges and lemons, while the Pecos Valley grows all the cereals, vegetables and grasses that can be grown anywhere on this continent, while the neighboring mines afford a home market for all products.

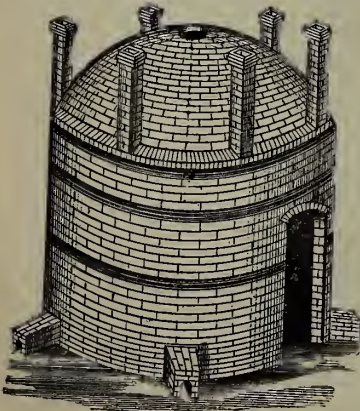
Our farmers raise two crops a year of grain and vegetables, five crops of hay, and stock grazes out doors all winter. Our climate is a perfect antidote for consumption and all throat and lung diseases.

Send for maps and illustrated pamphlets, giving full particulars.

PEGOS IRRIGATION & IMPROVEMENT CO.,
EDDY NEW MEXICO.



THE "ADVANCE" Brick and Tile Kiln



This down-draft kiln is easily built, easily managed, and very durable.

It is the best and cheapest kiln in use for the following reasons:

1st. It has no brick floor, it is made without arches and needs no repair when once built.

2d. The floor is made by leveling off the earth and consequently is always level and avoids unevenness in setting the ware to be burnt, and avoids much loss in cracking.

3d. It is the cheapest kiln to build because there is nothing to get out of order save the walls, and is easily kept in repair.

It burns evenly throughout and is adapted for burning any earthenware.

It has been thoroughly tested for wood and natural gas as a fuel.

It has a perfect draft and saves fuel, time and labor in burning.

For further information address

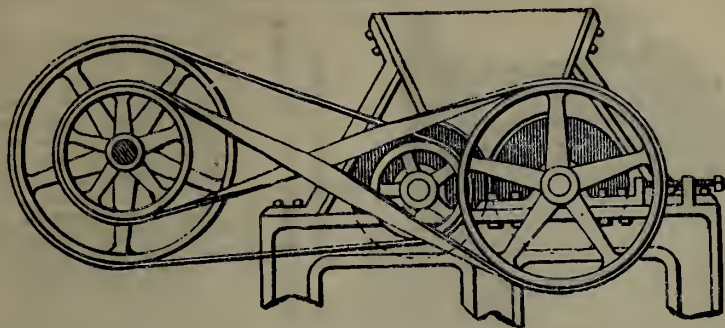
W. L. RICH,

ACTIVE AGENTS WANTED.

JONESBORO, IND.

The Crusher, Disintegrator and Stone Separator

PATENT APPLIED FOR.



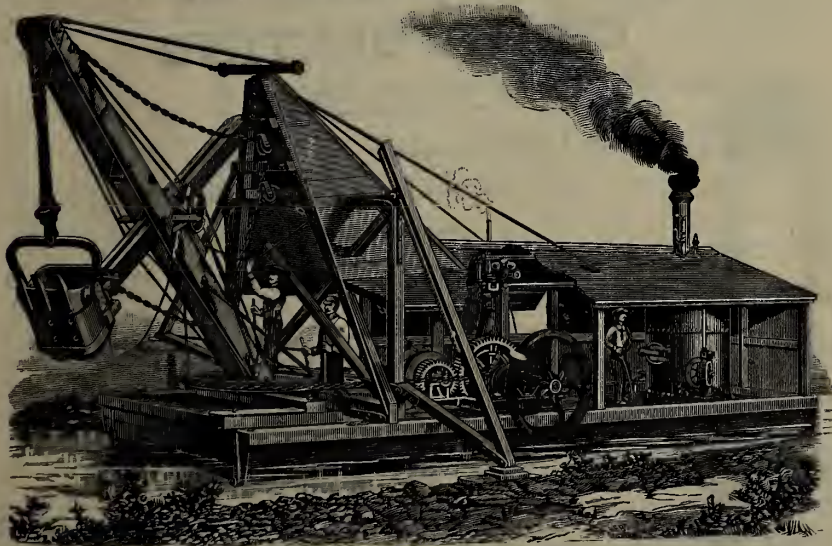
Every machine warranted. Satisfaction or no sale. Will work lumpy clay where other crushers fail. After a continued and thorough test, it is believed by those who are using it that the Crusher and Disintegrator as above illustrated is superior as a Crusher, as a Disintegrator and Stone Separator. Requires less power to run it. It is not liable to breakage. May be regulated to suit the conditions of the clay, with a capacity practically unlimited for the tile or brick business or other clay-working, and costing less than almost any machine of its character in use.

For prices, circulars, etc., address

S. V. MAXFIELD, Whiteland, Ind.

The Dredge Ditcher.

For Constructing Large, Open Ditches.

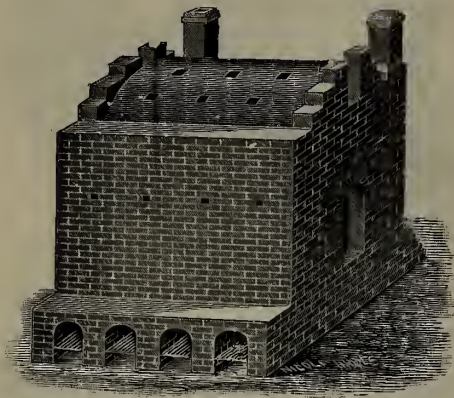


Manufactured by

MARION STEAM SHOVEL CO., 3 - - **MARION, OHIO.**

DAWSON'S PATENT KILNS!

SQUARE AND ROUND.



Down or Up-draft with-
out Changing Fires.

It consists in so constructing the kiln that the products of combustion can be made to pass up or down through the tile or other wares without changing the fires from one fire-box to another. This method of burning is much better than the old way where the tile, brick, etc., nearest the fire are burned too hard and those at a distance not burned enough. In the use of this kiln I have found it better to have the products of combustion passed down the tile during the earliest stages of burning which expels the moisture from the lower tile last; by so doing the moisture of the floor and benches is prevented from rising through the dry tile which are so likely to

crack in such cases. The above kiln requires no stacks and may be built any length desired and adapted to the use of any kind of fuel. The Round Kiln is arranged so as to fire from only one side and requires no stack. It is built upon the same principle as the Square Kiln. We have also a new special kiln firing from both sides which is thoroughly tested for the burning of common and press brick, brick pavers, terra cotta and all wares requiring an intense and even heat.

For full information and circulars address

W. E. DAWSON, Agent, Colfax, Ind

ELEVATORS
FOR
CLAY, COAL,
GRAIN,
ETC.



SECTION OF CONVEYOR.

ELEVATORS
FOR
TILE, BRICK,
PACKAGES,
ETC.

CHAIN BELTING

OF VARIOUS KINDS.

MALLEABLE STEEL,
WROUGHT AND SPECIAL.

SEND FOR

REDUCED
PRICE LIST.

THE JEFFREY MFG. CO.,

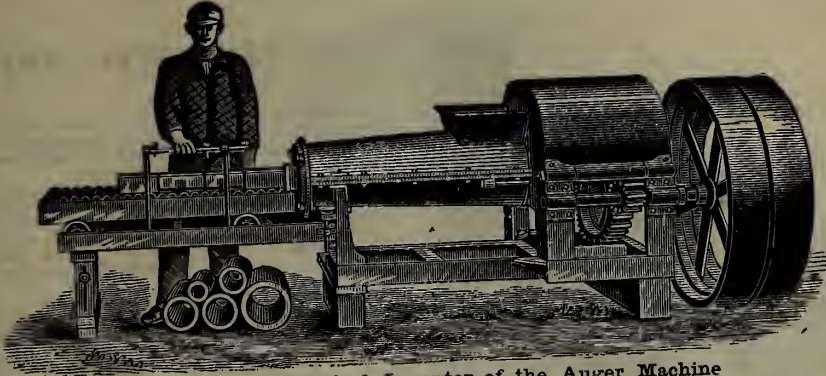
112 EAST FIRST AVENUE, COLUMBUS, OHIO.

CHICAGO BRANCH: 48 S. CANAL ST.
NEW YORK BRANCH: 15 CORTLAND ST.



KELLS & SON'S IMPROVED Brick and Tile Machines!

"Old, Reliable, Time-Tried and True."



P. H. Kells, the Original Inventor of the Auger Machine

This machine works clay direct from the bank for both brick and tile. Bricks are taken direct from the machine to the hacks and need no repressing for the finest fronts. It has but one set of gears and makes all kinds of Brick and different sizes of Tile by changing dies. For strength and durability we except none. We challenge the world to produce a combined machine that will do the same amount of work with the same amount of power. Patented June 22, 1880; and February 12, 1884. We can furnish Crushers and also Trucks. We can produce side cut Brick with our down cut-off, and make perfect edges and corners without the use of water or oil.

We have had Twenty-six Years' Experience in the Manufacture of Brick and Tile Machines.

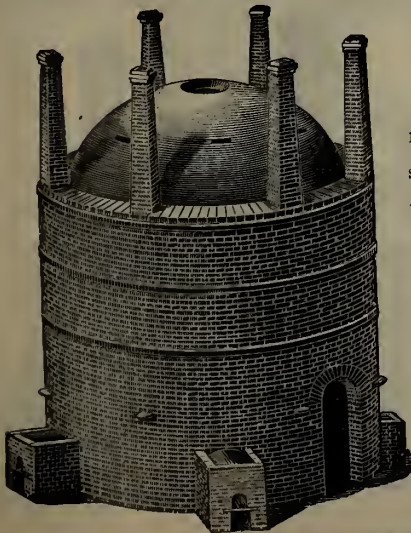
We have made an improvement on our No. 1 Machine by which we can make tile from three inches up to 12 inches and on our No. 2 Machine we can make tile from 2½ up to 10 inches.

For Illustrated Circulars, Prices, etc., address

Shop near New Court House. **KELLS & SONS, Adrian, Mich.**

BRICK AND TILE BURNING.

A NEW SYSTEM.



This is a down draft kiln, easily built, easily managed and very durable in points of construction. The wares can be burned hard and uniform throughout. This kiln is better adapted to burning tile and brick than any we have seen.

THE KILN SPEAKS FOR ITSELF.

We will be glad to correspond with any who think of building kilns for burning fire brick, common brick, terra cotta, and especially drain tile. Address

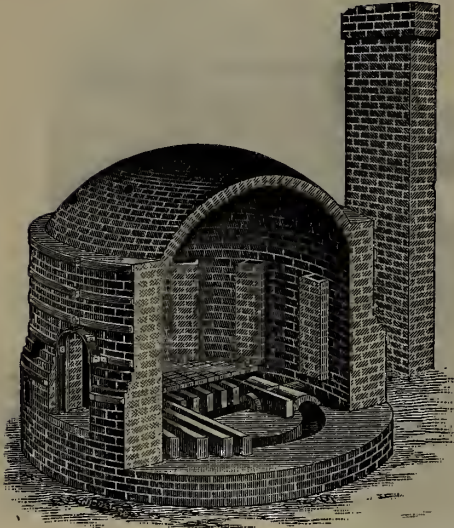
W. A. EUDALY,

CINCINNATI, OHIO

64 Johnson Building,

"NEW DISCOVERY" KILN.

PIKE & SCHOPP. INVENTORS.



→IT+LEADS+THE+WAY←

THE "NEW DISCOVERY" is a round down draft kiln with no grates, furnace doors, sub-arches or dampers except at the stack, bound with iron bands securely fastened to an arched iron door frame.

This kiln is the result of years of experience by practical and successful tile and brick makers at a cost of thousands of dollars. Perfect draft and perfect combustion are indispensable to a perfect run—both are claimed in this kiln and the result is, that anything made from clay is successfully and perfectly burned.

It can be built for either wood or coal and the burning is easily managed. Time, fuel, wages of burner, use of kiln, cooling of ware, all nearly one half saved. Kiln, yard or other rights sold reasonably. We guarantee this kiln to keep up its reputation wherever it goes.

Everybody is invited to visit our works and see the "NEW DISCOVERY" in actual operation.

We shall protect our patents from infringements. Send for circulars and testimonials.

Active resident agents wanted. Address

PIKE & CASTLE,
CHENOA, ILL.

The "Grawcock"

:-New and Improved Brick and Tile Kiln:-

PATENTED JULY 31, 1888.

This Kiln is offered to the Brick and Tilemakers of this country, as the best known in use.

This Kiln is the result of fifteen years' experience in the manufacture of Brick and Tile by a practical and successful tilemaker and burner.

It is a conceded fact that perfect drafts and perfect combustion is indispensable to a perfect Kiln. Such is my NEW IMPROVED KILN.

This Kiln is a down-draft Kiln, securely bound with five iron bands, and can be made any size under 25 feet in diameter, and is built round, oblong or square in form.

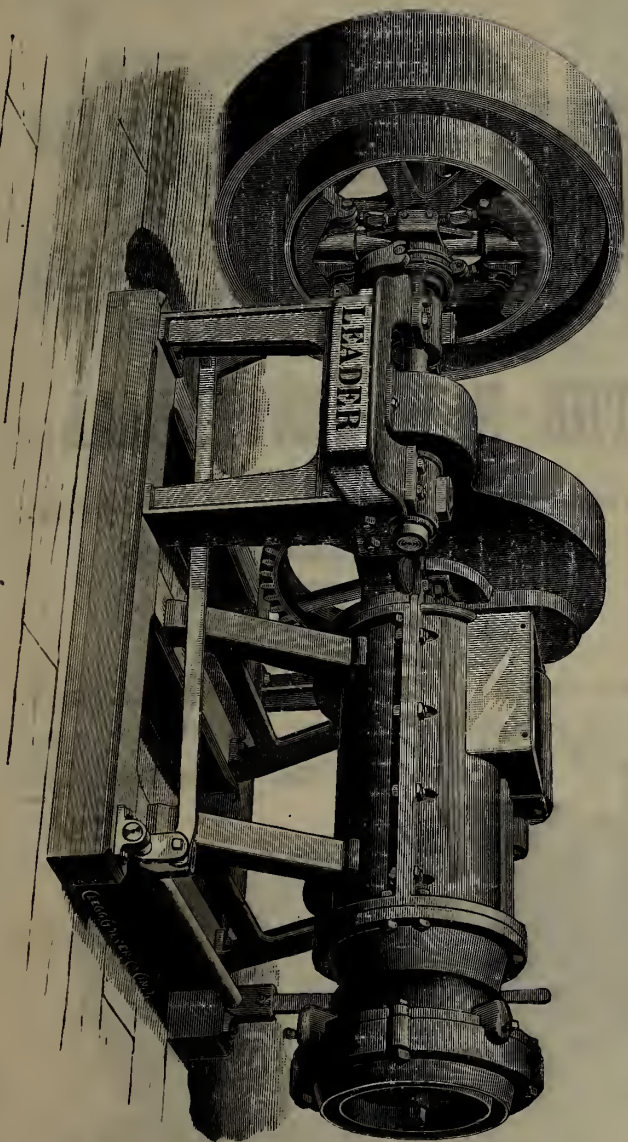
This Kiln is especially adapted for burning Tile, Brick, Sewer Pipe, Terra Cotta, Fire Brick, and all kinds of Pottery ware. Can be adapted for either coal, wood, natural gas or crude oil. This Kiln burns uniformly throughout, from top to bottom, and does not require an experienced burner to fire it, as it is self-regulating, and anyone with ordinary care can burn it through from the beginning.

The inventor claims economy in fuel, and a saving of time in burning, wages of the burner, durability of the Kiln, and time of cooling the ware—all about one-half—besides producing all perfect, straight, hard, evenly burned ware. Kiln rights for sale. For information, address



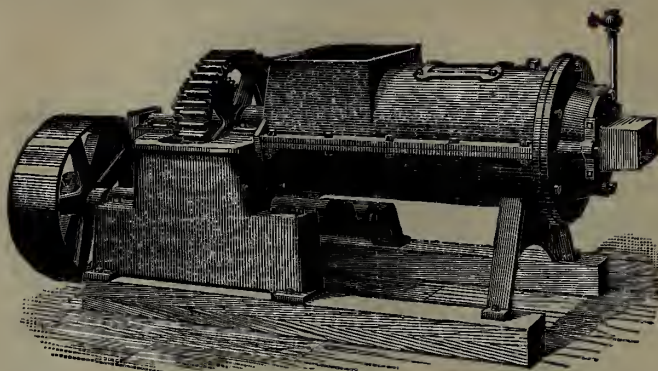
J. B. GRAWCOCK, Churubusco, Ind.

The Decatur Leader Mfg. Co., DECATUR, ILLINOIS.



Manufacturers of the simplest and best line of Brick and Tile Machinery on the market. Send for Circulars. **THE DECATUR LEADER MFG. CO., Decatur, Ill.**

TIFFANY IRON WORKS, Tecumseh, Mich.



THE NEW CENTENNIAL

MAKES THE BEST

BUILDING BRICK, PAVING BRICK and FIRE BRICK.

CAPACITY FROM 20,000 TO 40,000.

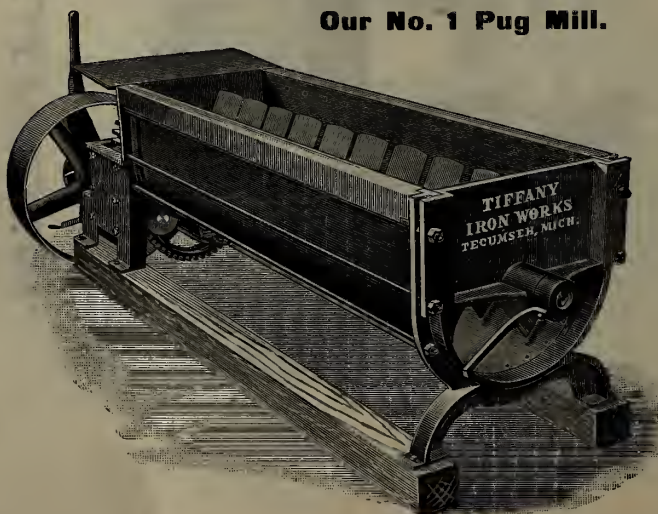
No Seams or Laminations.

HOLLOW BRICK,

ORNAMENTAL BRICK,

ALL SHAPES OF BRICK AND TILE.

Our No. 1 Pug Mill.



NEW AND SUPERIOR DESIGNS IN CLAYWORKING MACHINES.

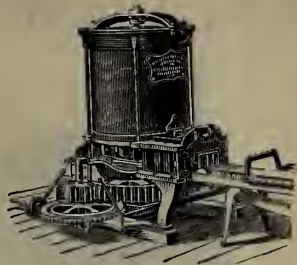
PLANS AND ENTIRE PLANTS OF MACHINERY FURNISHED.

Advertisements.

THE PENFIELD MACHINERY

FOR
**BRICK
AND
TILE.**

Cut of No. 5 Auger Machine will
appear in next number.

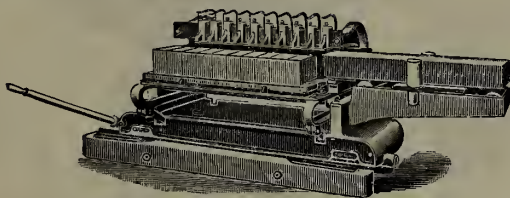


No. 7 Plunger Machine.

PLUNGER MACHINES, 7 Sizes ;

AUGER MACHINES, 4 Sizes ;

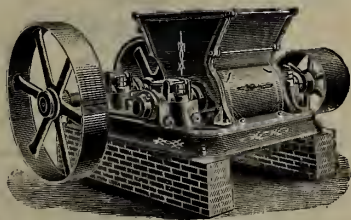
BOARD DELIVERY CUT-OFF TABLES ;



No. 5 Board Delivery Cut-off Table.

CRUSHERS, DISINTEGRATORS, PUG MILLS.

**PULLEYS, SHAFING,
HANGERS, YARD SUPPLIES,
ETC., ETC.**



18-inch Disintegrator.

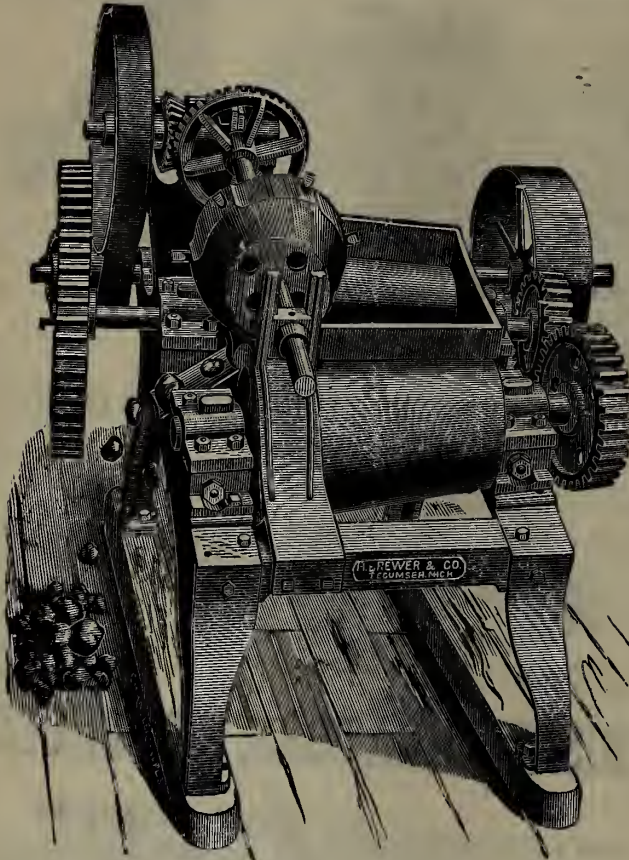
Send for our Junior Catalogue, No. "A." Address,

J. W. PENFIELD & SON,

Mention this paper.

WILLOUGHBY, OHIO.

H. BREWER & CO., Clay Crusher and Stone Separator!



PATENTED MARCH 3, 1885.

ADVANTAGES:

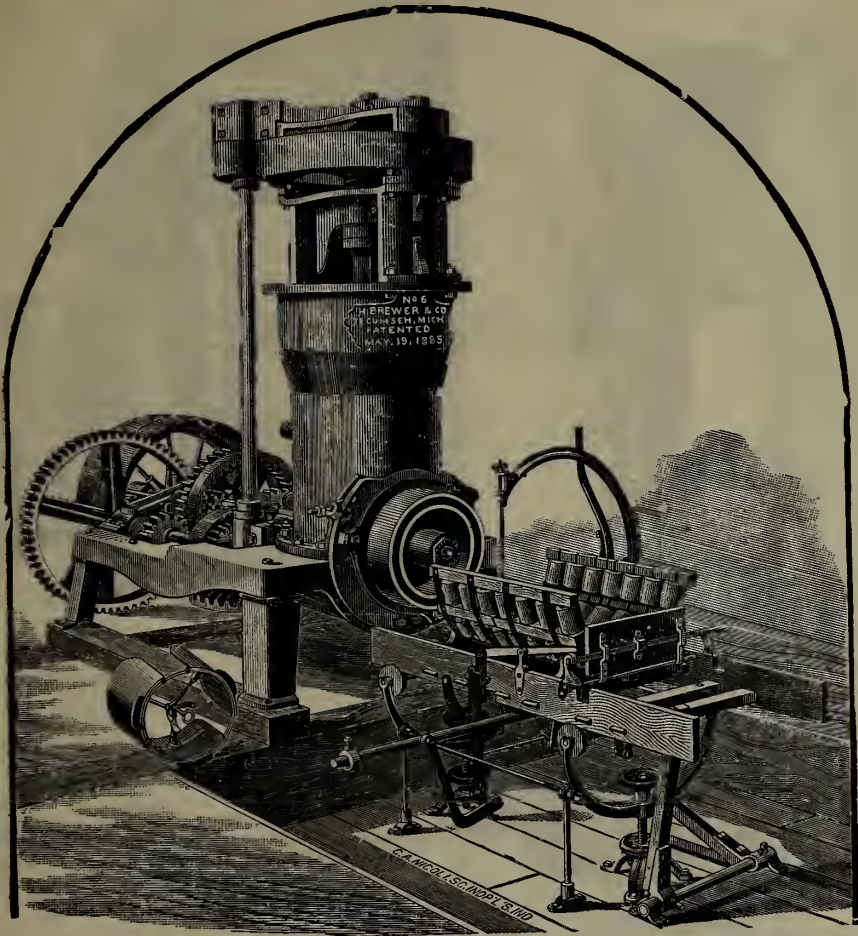
- The following are among the advantages claimed for this form of construction:
- 1st. As the crushing rolls are smooth there is no undue wear of the rolls at any point.
 - 2d. The rolls are thoroughly chilled so that the wear is reduced to a minimum.
 - 3d. As there are no beads, threads or corrugations to wear, the rolls can always be kept equally distant from each other at all points, so that no stones can pass between them.
 - 4th. The stones are effectually separated from the clay and discharged at the large ends of the rolls.
 - 5th. All lumps or clods of clay, whether moist or dry, are broken up and forced between the crushing rolls so that no clay is discharged off their ends with the stone.
 - 6th. The passage for the discharge of stones is rendered adjustable so that stones of any size or shape can readily escape.
 - 7th. The gears which connect the crushing rolls can always be kept the same distance in mesh, regardless of the fact that the rolls may be brought closer together to compensate for wear.
 - 8th. The capacity of the Crusher, even at a moderate speed, is sufficient for the requirements of any tile machine.

For circulars and prices of Crushers, Tile Machines or Brick Machines, address—

H. BREWER & CO., Tecumseh, Mich.

The prominent feature in this Crusher is the combination of two smooth, tapering crushing rolls, running at different speeds, in connection with an adjustable transverse roll, which is of irregular form and provided with teeth or spurs, whereby the clay is rapidly broken up and crushed, and the stone separated therefrom.

H. BREWER & CO.



Crawfordsville, Ind., May 21, 1888.

H. Brewer & Co., Gentlemen—We are getting along nicely with the second No. 6 Machine. It makes good tile as fast as they can be handled and fully meets my expectations. We have 4,000 12-inch tile $16\frac{1}{2}$ inches long on our shelves made in two days. I have frequently turned the 7-inch and they come out at the rate of 9 per minute, $16\frac{1}{2}$ inches long.

Mr. Lee operates three factories, two of which are supplied with our No. 6 Machine.

Joliet, Ills., March 28, 1888.

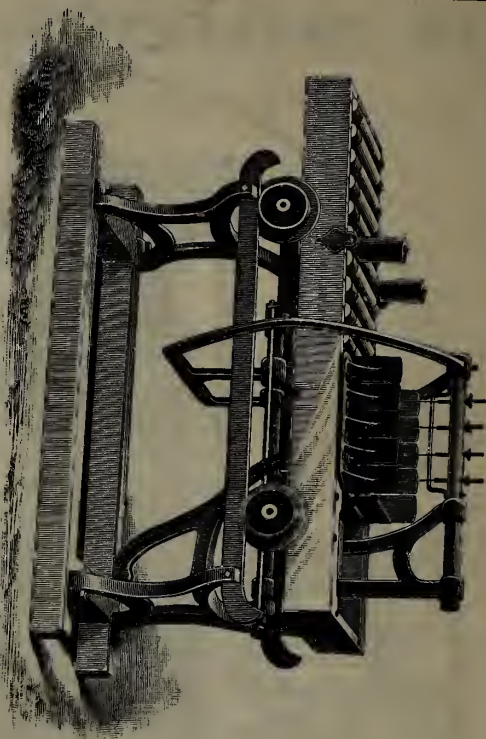
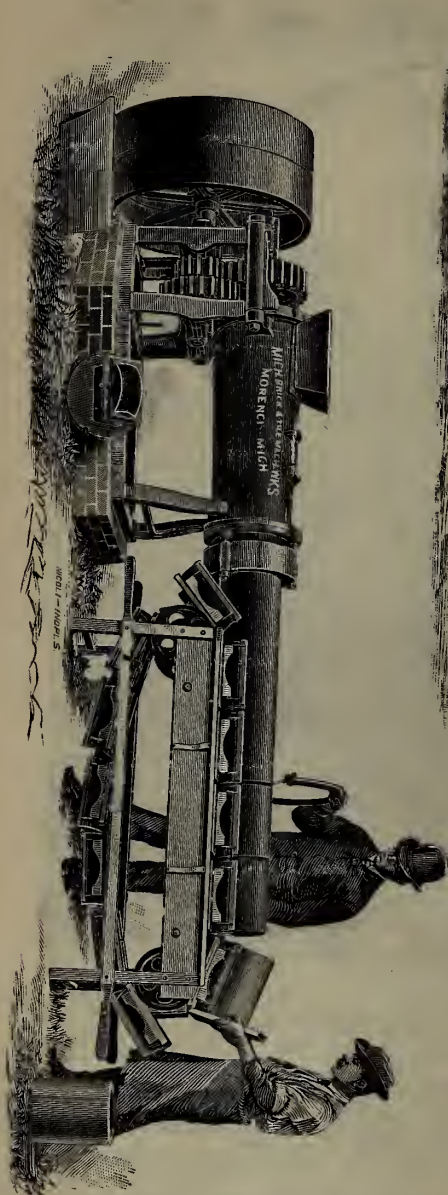
Messrs. H. Brewer & Co. Dear Sirs—The No. 6 Machine arrived in good order and has been given a partial test. It makes a better tile than any other machine we now have and does not seem to take any more power, and as to speed with our clay, we feel satisfied that we can make all the tile we can handle.

Yours Truly, JOLIET MOUND DRAIN TILE CO.

The above Company are using four different machines.

It has no bearings in the clay, nor can clay work into any of the journals. It uses neither bridge or hollow shaft. Sizes of tile up to 6-inch issue in two streams, and larger sizes in single stream. None of the gears or shafts are disturbed, but all remain in the machine whether it is issuing double or single stream tile. Equally well adapted to the manufacture of both large and small tile. It has a capacity to meet the needs of any factory. For descriptive circulars and prices, address

H. BREWER & CO., Tecumseh, Mich.



ESTABLISHED 1856.

INCORPORATED 1891.

35 YEARS OLD

And never felt better. Why? Because the successful Brick and Tile Manufacturers are convinced that the

AUGER MACHINE

is the BEST and are using them. We make, sell and guarantee the best

AUGER MACHINE,

CUT-OFF TABLES, TILE CARRIERS, ETC.,

on the market. Trade is booming. Never better—purchasers happy; they find everything just as represented and our machinery working to their entire satisfaction.

Write to us for any information you may want and be sure and tell us to send our catalogue and photographs of our new machines—just out. They are made on honor and turn out better brick and tile than was thought possible to manufacture a few years ago. Send us two or three barrels of your clay; we will test it for you and send you some brick made of it free of charge.

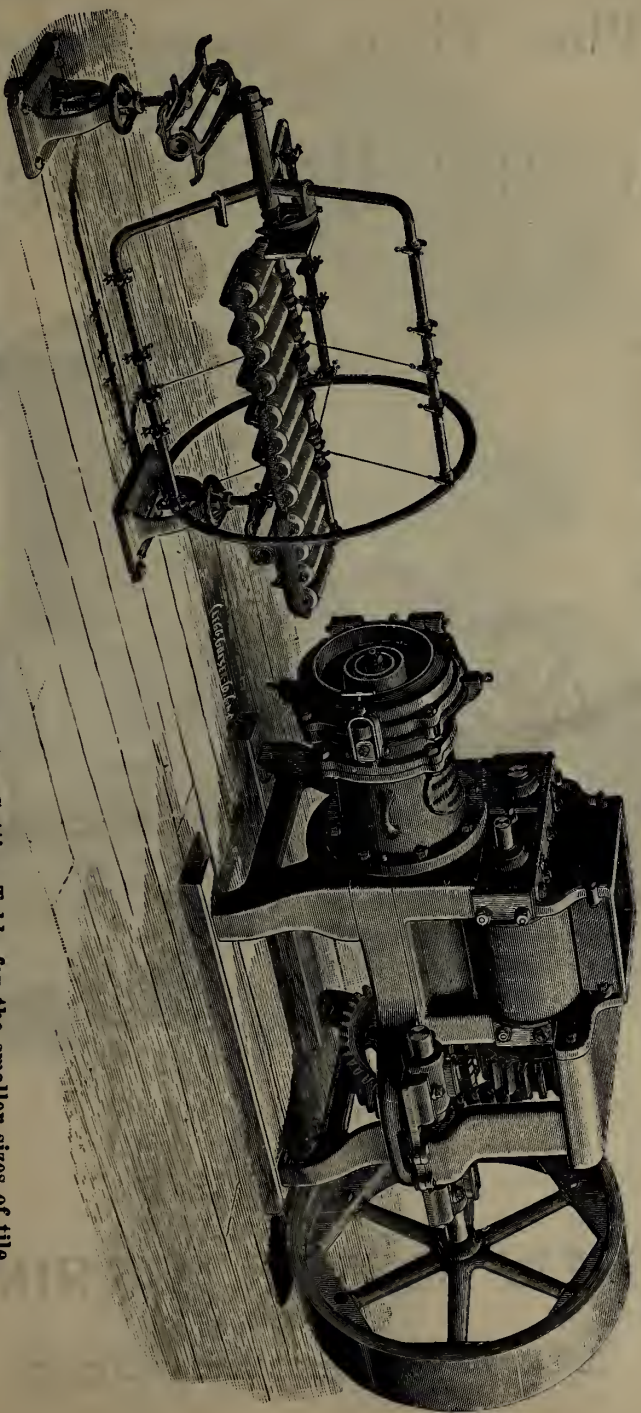
MICHIGAN BRICK & TILE MACHINE CO.,

[Mention the Drainage Journal.]

MORENCI, MICH.

Improved "OHIO" Tile Machine

WITH IMPORTANT NEW FEATURES.



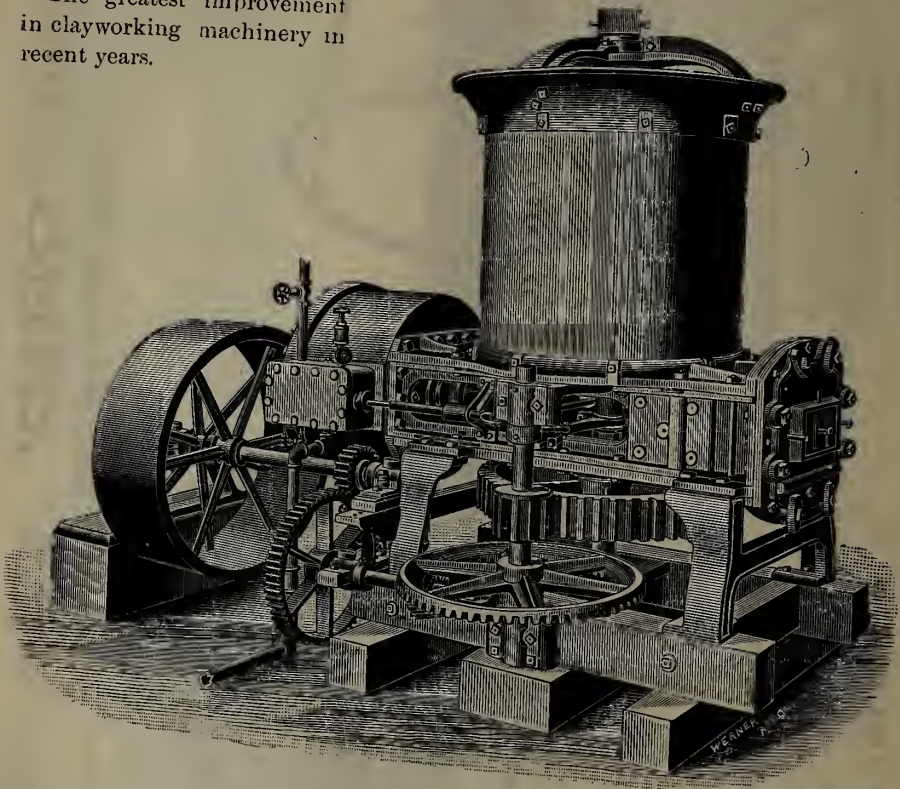
Size "C" with differential Clay Crusher, and Revolving Cutting Table for the smaller sizes of tile.

SAVE MONEY by buying "the Best." **AVOID** the daily loss and vexation from tinkering inefficient machines. **SHUN** the expense of repairs and costly delays arising from the use of cheap machinery. **WRITE** us for reference book and Catalogue. Address,
N. B. We manufacture a line of Clayworking Machinery.

E. M. FREESE & CO., Gallon, Ohio.

The Titus Steam Press Tile and Brick Machine.

The greatest improvement
in clayworking machinery in
recent years.



PATENTED APRIL 14, 1891.

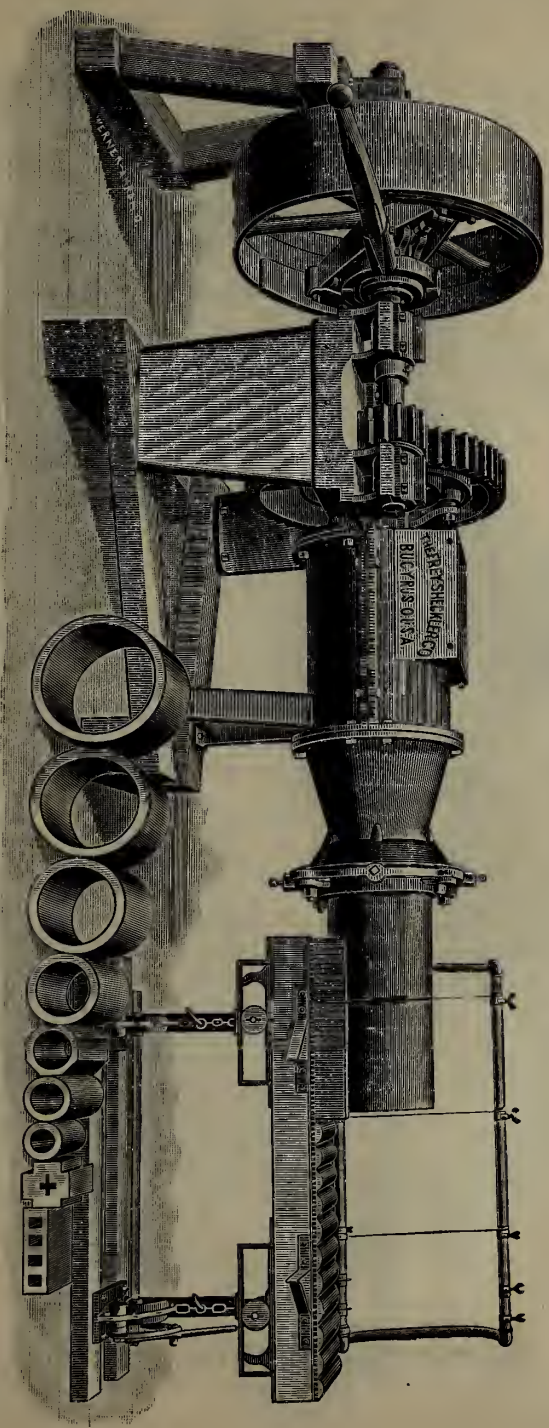
For full information and circulars address

THE NEW BREMEN MACHINE CO.,

New Bremen, Ohio.

THE MASCOT BRICK & TILE MACHINE

FOR DRAIN TILE, END AND SIDE-CUT BRICK.



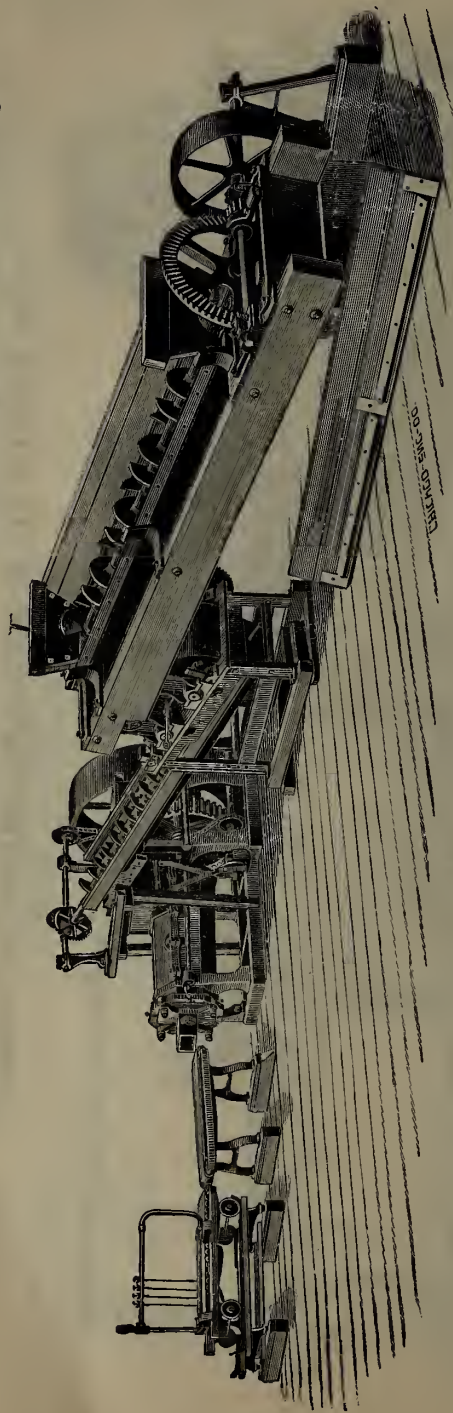
We make eight sizes of Brick and Tile Machines, also a large variety of Clay Crushers, Pug Mills, Cutting Tables, Elevators, Dump Cars, Brick and Tile-yard Supplies. Our interesting Catalogue will be mailed upon application.

THE FREY-SHECKLER CO.,

Manufacturers of Clayworking Machinery,

BUYRUS, OHIO, U. S. A.

BRICK AND TILE MACHINERY.



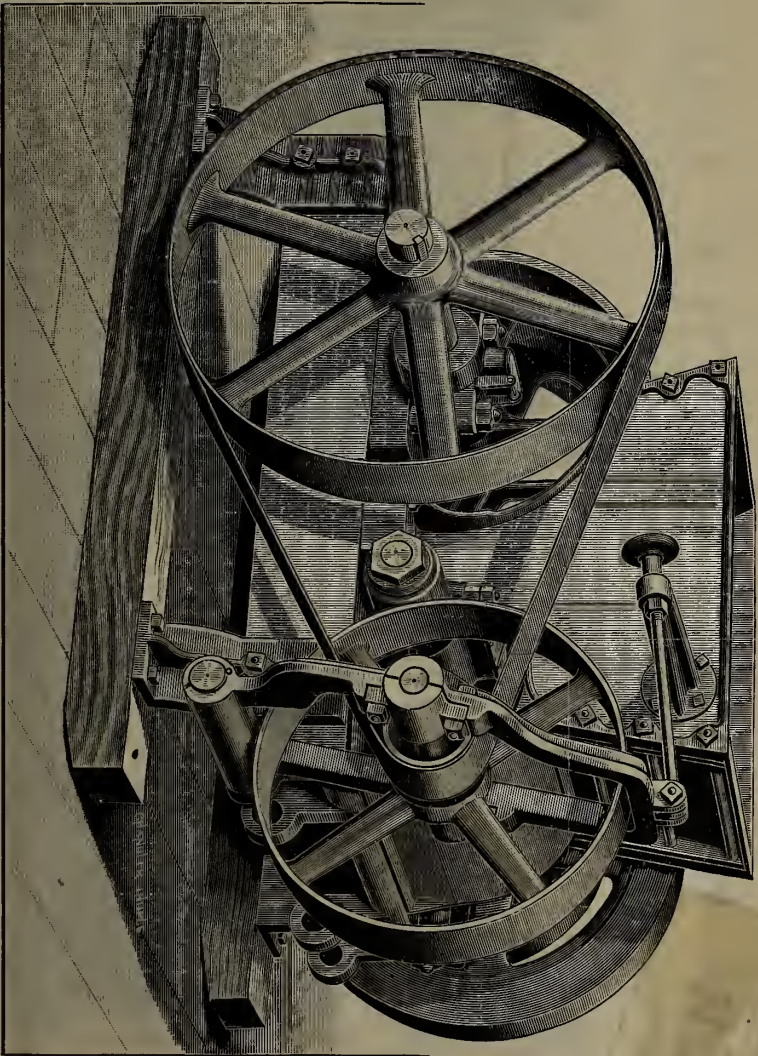
New Machinery, new Clay Conveyor, new Automatic Cutting Table,
specially adapted to cutting paving brick.

Write for Catalogue and information. Address

Adrian Brick & Tile Machine Co.,
ADRIAN, MICH.

THE POTTS DISINTEGRATORS ARE THE BEST

And only machine made that will take any clay either wet or dry direct from the bank and grind it, leaving it in a loose, open condition. It does not choke or clog as the Roller Crushers do, neither does it pack the clay in thin, tight sheets. It grinds the smaller stone and throws out the larger ones. These machines are without a doubt the best on the market for preparing clay for the manufacture of drain tile; If the clay in the bank be, of two or three kinds, it will thoroughly mix them.



Every machine is guaranteed to do as claimed for it or no sale.
Write for prices.

C. & A. POTTS & CO.,
INDIANAPOLIS, IND.

NEW DEPARTURE TILE MACHINE

THIS Machine makes from 40 to 45 18-inch tile, 24 inches long per hour, without making one imperfect tile, preserving them in perfect form—not even breaking the grain of the clay.

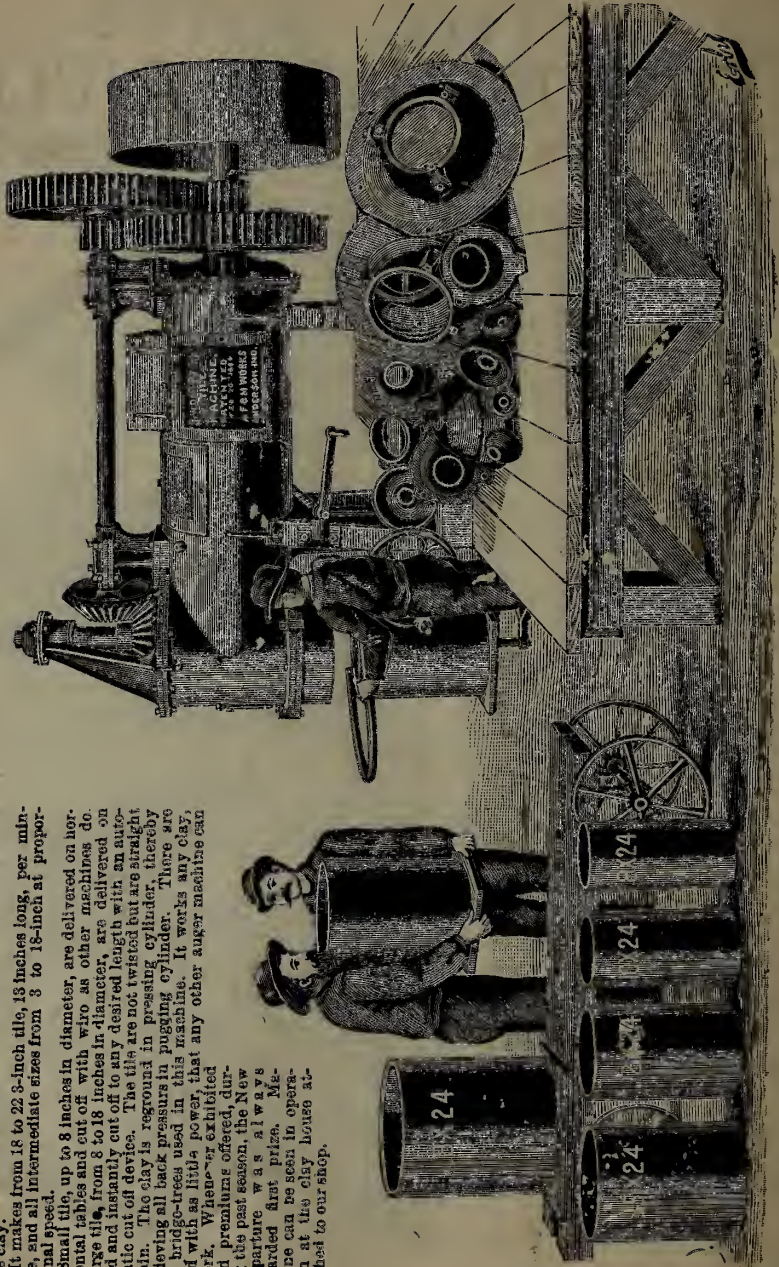
It makes from 18 to 22 3-luch tile, 18 inches long, per minute, and all intermediate sizes from 3 to 18-inch at proportional speed.

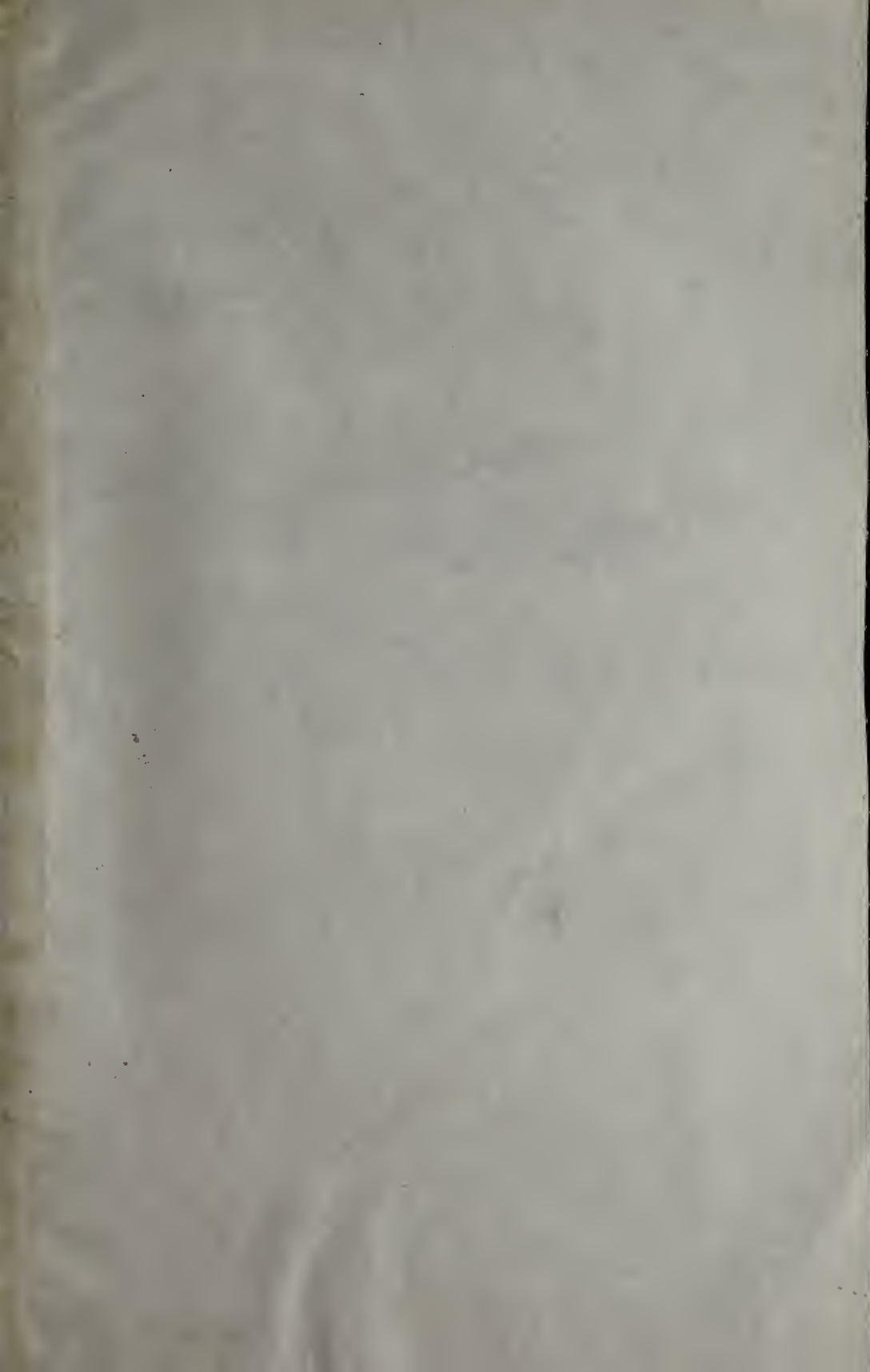
Small tile, up to 8 inches in diameter, are delivered on horizontal tables and cut off with wire as other machines do. Large tile, from 8 to 18 inches in diameter, are delivered on end and instantly cut off to any desired length with an automatic cut off device. The tile are not twisted but are straight grain. The clay is reground in pressing cylinder, thereby relieving all back pressure in puging cylinder. There are no bridge-trees used in this machine. It works any clay, and with as little power, that any other auger machine can work. Whenever exhibited and premiums offered, during the past season, the New Departure was always awarded first prize. Machine can be seen in operation at the clay house attached to our shop.

For full information and circulars, address:—

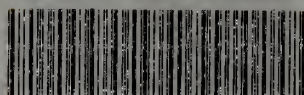
ANDERSON FOUNDRY & MACHINE WORKS,

Anderson, Ind.





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